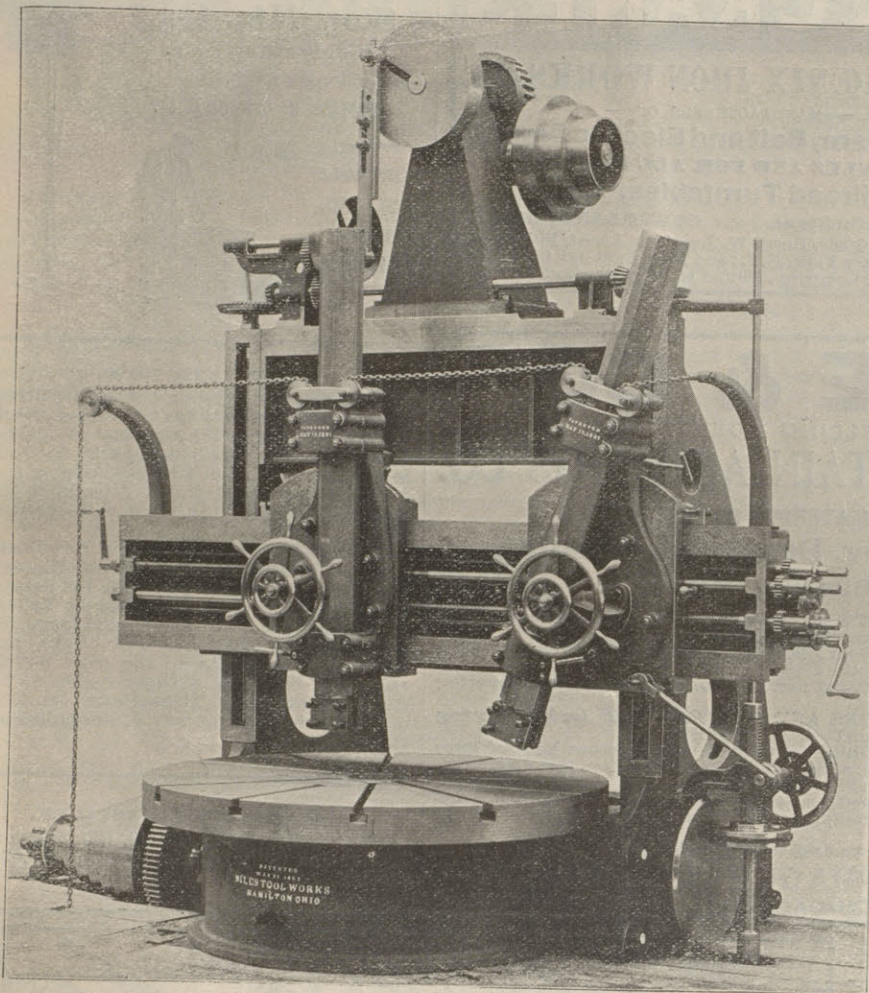


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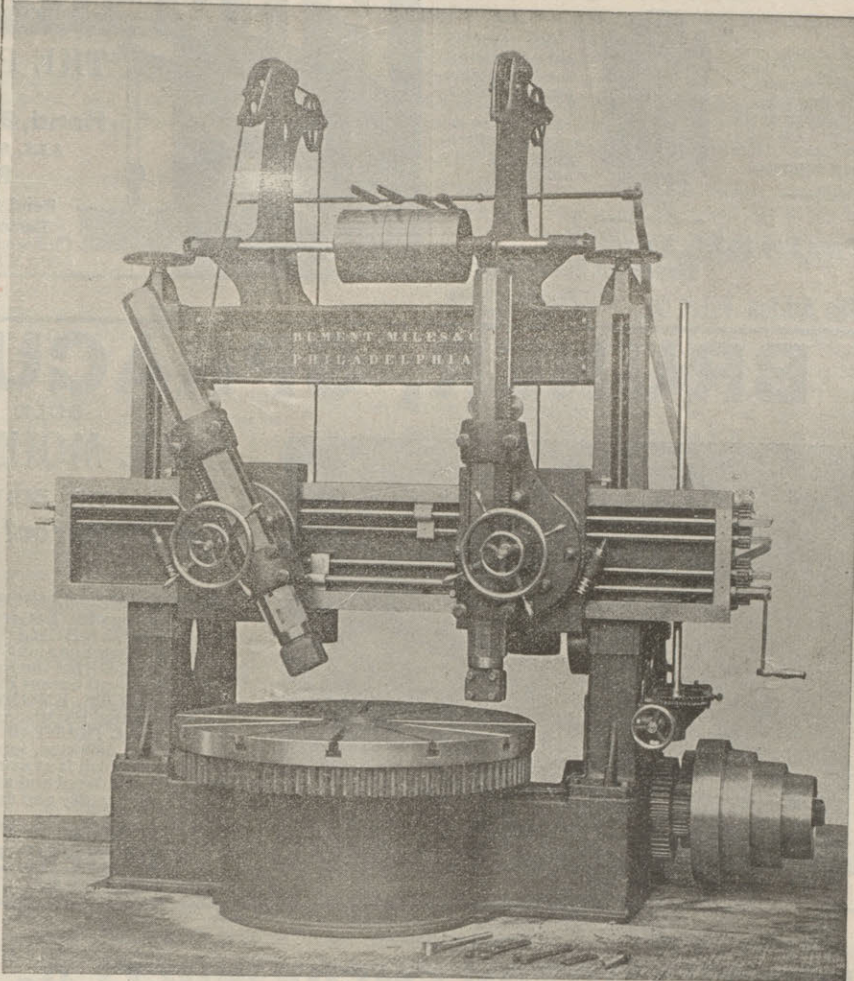
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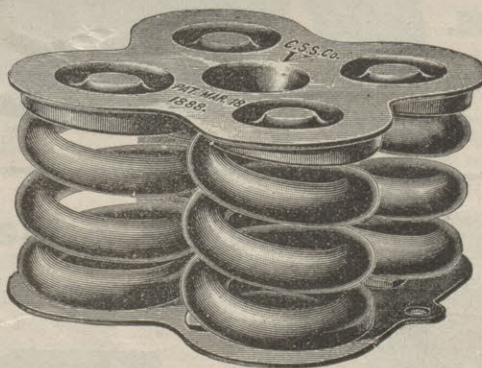
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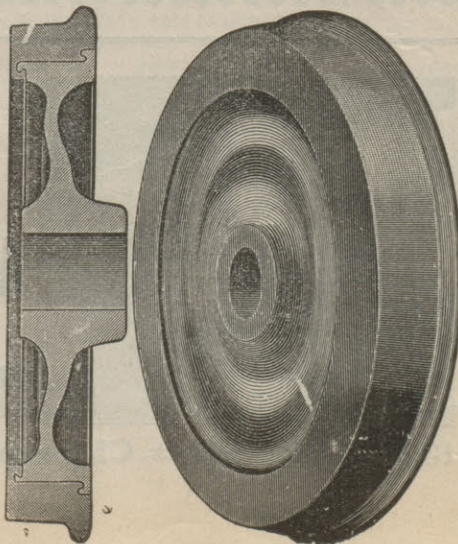
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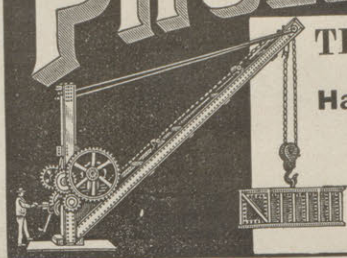


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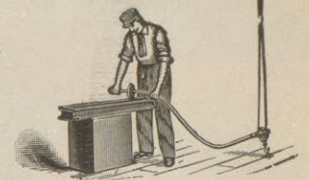
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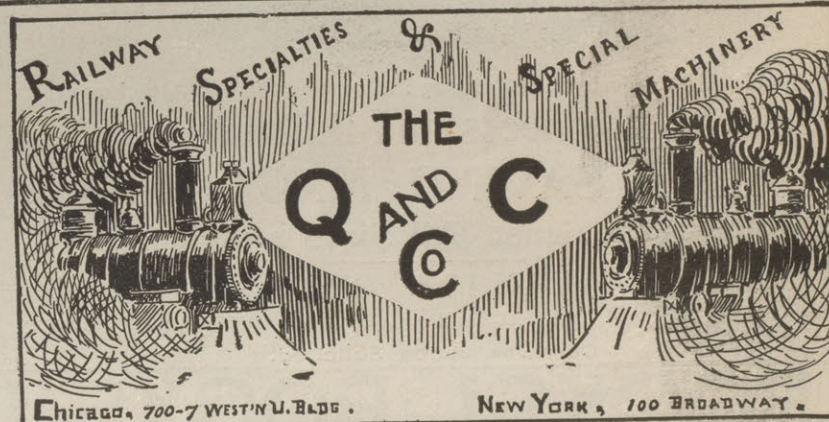
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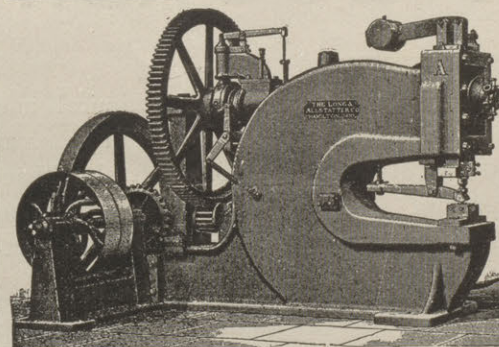
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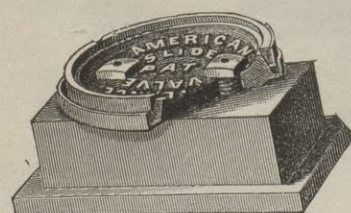


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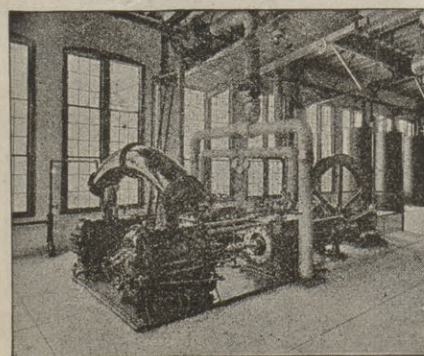
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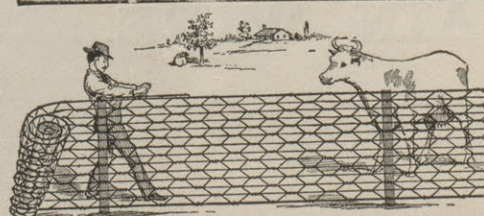
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No. 29.

JULY 18, 1896.

XXXVI.

OXIDIZING AND BLACKING BRIGHT STEELWORK.—The following directions for oxidizing and blacking the bright work of steel in lieu of paint, to stand heat and wear well, is taken from a recent issue of the English Mechanic: "Take three ounces of glacial acetic acid, mix it with its weight of water; to this add half an ounce of powdered nut galls, and let stand for a day or two, shaking it up occasionally; then let settle, then pour off the clear, then put a pint of water to the residue. When cold and settled pour off the clear and mix with the first. Now to this add a grain of nitrate of silver or sulphate of copper, or nitrate of copper. Dissolve whichever you use in a little hot water before mixing with the other liquid. Silver is the best process. Clean all oil off and rust or scabs, paint, etc. Clean all up with bright pumice-stone powder. Don't use emery in any form, but the above with a piece of wood. Then clean all off; dry with air-slaked lime. Now go over it with the liquid with some cotton wool. If you have saved your powdered galls take a little of that upon your wool, and you will find that a great acquisition in the first application. Let stand until dry, and give it another coat. When dry scratch-brush it, and give it another coat, etc. When you have got it to your liking give it some linseed oil and camphor. All bright iron parts can be made like ebony polished, and with the gun metal mounting you will have a picture in black and gold. Cylinder covers, etc., can be done the same, but you must wash with hot water before oiling it. It will stand any amount of heat, the hammer and friction in wiping; you have no blistering, and you will have some difficulty in eradicating it. Bicycles, repairs, handle bars, etc., can be treated the same way to advantage, well washed with hot water; when dry give them a coat of good copal carriage varnish."

SKILL IN ESTIMATING ENGINEERING WORK.—The skill shown by the late General Casey, chief of army engineers, in estimating in advance the cost of engineering will be better appreciated when we recall the errors made by others in similar calculations. The estimated cost of the Manchester ship canal was \$28,750,000. Nearly \$80,000,000 was spent before the canal was ready for business. The international commission reported in 1856 that the cost of digging the Suez canal would certainly not exceed \$40,000,000. It had cost \$94,500,000, to say nothing of Egypt's gratuitous building of lighthouses, dredging of the harbors, advance of money without interest, and gift of forced labor, the whole amounting to \$20,000,000 more. Engineers spent a year collecting data for their report on the Congo railroad, which they asserted could be built for \$5,000,000. They now say that the total cost will be from \$12,000,000 to \$13,000,000. The egregious underestimate of the cost of the Panama canal nearly swamped that enterprise before wholesale stealing completed the ruin. The forts on the Meuse river, estimated at \$4,500,000, cost \$16,000,000; the Corinth canal cost \$12,000,000 instead of the estimated \$6,000,000; a harbor and a railroad on the island of Reunion cost \$13,500,000 instead of \$6,800,000; the Senegal Railroad, which was to be completed for \$2,600,000, absorbed \$9,000,000, add the Langson Railroad in Tonkin, which was to open a conquered province for an expenditure of \$500,000, bled the French treasury to the tune of \$4,367,790.—[Army and Navy Journal.]

CONDENSING ENGINES FOR ROLLING MILLS.—At a recent meeting of the Middlesbrough District Association of Foremen Engineers and Mechanical Draftsmen, Mr. Robt. J. Worth of Worth, Mackenzie & Company, Ltd., engineers, Stockton-on-Tees, read a paper on "The Application of Condensers to Rolling Mill Engines". He remarked that owing to the fact that steel was rapidly superseding iron, the rolling mills no longer had that superabundance of steam which formerly was raised by the waste heat from the puddling furnaces. Economy of steam in rolling mill engines was formerly a matter of no consequence, but now it was becoming one of primary importance. The difference between a rolling mill with engines of the type usual in the north of England and a mill laid out on the best system for the economy of steam was, he believed, just the difference between one that barely paid and one that returned a good profit to the owners. Thus, if an engine of the usual size, with a pair of 42 in. cylinders and 5 ft. stroke reversing, were taken, the difference in the steam consumption between the ordinary type and a fairly economical type, if the engine ran six hours per shift and 10 shifts per week, and the value of the coal delivered were \$2.00 per ton, would amount to a saving of \$305 per week, or on a year of 48 weeks, \$14,600. By the alteration of a cylinder and the addition of a condenser to a smaller engine a larger proportion of saving in steam had actually been effected. Mr. Worth showed that the lighter an engine was loaded, the greater the saving in steam consumption, and as in a "pull over" or "crab reversing" mill, the time during which an engine was running empty or lightly loaded formed a very large proportion of the total running, the saving with mills of this type and with engines well up to their maximum work would be very great. There were circumstances, however, where the savings effected by the use of a condenser were greater and more important than those mentioned. These were when the engine was under its work, and when the workmen in conse-

quence had to wait a considerable time for the engine to get up speed. The additional power and speed would generally be from 40 to 50 per cent, and that would represent a great saving in labor. The main engines using less steam would leave more for the auxiliary engines, and a more regular pressure would thus be maintained in the boilers. The author recommended the "ejector condenser" on account of its great simplicity, the absence of any working parts, and the fact that it needed no attention.

MISLEADING FIGURES.—The Railroad Gazette and Railway Age have published their semi-annual statements of new mileage in the United States during 1896, and, as usual, the figures are so wide apart as to cause considerable doubt as to the correctness of either. Both papers have been considered authorities for so many years that their statistics are published very widely in the daily and weekly press, and it is for this reason that the errors are of a very serious character, as they tend to greatly mislead the public. In comparing a few of the totals by states we find that in Ohio, for example, according to the Railway Age, 54 miles of line were built, and according to the Gazette, 44. Michigan has 54 miles according to the Age, and 40 according to the Gazette. Florida has 61, according to the Age, and 50 according to the Gazette. Arkansas is credited with but 2 miles in the Age, and 77 miles in the Gazette a difference of 75 miles. In the totals the Age has 788.2 miles, and the Gazette 717 miles. In January last when these journals published their totals, the Manufacturers' Record called attention to the wide difference in their figures at that time, and made a suggestion that the statistical editors of the two papers get together and try to reach a better understanding. This last report, which, as far as the south is concerned, is glaringly incorrect, emphasizes the suggestion which we made at that time.—Manufacturers' Record.

STEAMBOAT RACING.—Every time a race occurs between fast steamboats on the lakes or elsewhere in this country we hear a great deal of talk about government laws against racing. Usually this argument is resorted to by the weaker fellow in the controversy, or the fellow who has been beaten and refuses to acknowledge it. As a matter of fact there is no law in the United States against steamboat racing any more than there is against a race between sailing vessels. All the officers of the steamboat inspection service in this country might be aboard two vessels that were actually known to be engaged in a race and still be powerless to prevent it or to punish the officers or owners of either vessel afterward. There is no law of the United States against the speed of vessels, excepting in fog or in canals or other narrow waterways over which the government exercises special jurisdiction. The steamboat inspection laws provide that in thick weather vessels must proceed at a moderate rate of speed, but they do not even say what this moderate rate of speed shall be. Ten or twelve miles an hour would be a moderate rate of speed for some passenger steamers, while it would be a high rate for the ordinary freight carrier. But of course, it is well understood that the steamboat laws specify the steam pressure to be carried in the boilers of every ship of the United States that floats. In this respect the law is a safeguard against the danger of explosion due to recklessness that might accompany racing, but only when this pressure has been exceeded is the law violated. Whatever may be said about instructions from owners, or the rules of corporations owning ships, it may be taken for granted that every time there is a meeting of two steamers, between which rivalry exists, a race is sure to result and the full limit of steam will be used when it can be had. There is little danger in this full use of steam however, as government rules for the construction and inspection of boilers make big allowances for safety.—Marine Review.

THE ACTION OF COAL GAS ON RUBBER TUBING.—M. Groshentz has been investigating the action of coal gas on rubber tubing. He found when a pressure gage was connected to the gas supply by means of rubber tube and the stop-cock closed, in twelve hours there was not only no pressure, but actually a defect of pressure indicated by the gage. Then he found that the tube had gained weight, for it had absorbed and, as it were, dissolved the gas; and then he found that the greatest sinner in this respect was the purest rubber, black rubber, which contains $\frac{1}{2}$ to $1\frac{1}{2}$ per cent of solids; next came red rubber with its 11 or 12 per cent; and the best of all was the ordinary grey rubber with its 52 to 55 per cent of added solid material. The last will endure the longest time before allowing gas to permeate it so as to produce a smell in the apartment.—[Gas World.]

CARE OF TRACK TOOLS.—Referring to some articles concerning the care of tools, Jerry Sullivan in Roadmaster and Foreman notes that while all material, all tools and all property belonging to the company should receive proper care, an undue amount of tenderness in handling tools may lead to loss in time and money. Every tool should be required to perform every service it is capable of, without being subject to serious injury. If the end of a tie can be held up to the rail with a shovel it would be a waste of time to wait until someone walked eight or ten rails for a bar to perform the same service. One writer says: Do not strike the heel of a clawbar with a hammer when pulling spikes. If this is not done a man is sent for an adze to cut away a little sliver of wood, perhaps, that prevents the claws securing a good hold on the spike, and in course of time the man returns with the adze, hacks away at the wood and hits the spike, knocking a gap in the adze. If a tap on the heel of a clawbar will give it a grasp on the

spike, by all means tap it; that is what the heel was put on the clawbar for. The track must be taken care of as well as the tools; in fact, the care of tools should be a secondary consideration, unless the track is in first-class condition. The tools pertaining to an ordinary section do not cost as much as the labor of the gang employed thereon during one week. If a man does good work and lots of it, no railroad official will warn him against straining his tools. An eastern farmer once asked a man who applied for work in the harvest field: "Did you ever break a pitchfork handle?" "No, sir," said the man. "I never did." "Well, I don't want you," replied the farmer. "I cannot afford to employ a man who is afraid to get too much hay on his pitchfork." Take care of your tools, certainly, but do not waste any time doing it. Tools were created for man, not man for tools.

THE COST OF WIRE.—In an address by Thomas Morris before the Staffordshire, Eng., iron and steel works' managers on the remarkable achievements that have been reached in the manufacture of fine wire, the interesting fact was mentioned that the lecturer had been preserved by Warrington, the wire manufacturer, with specimens for which \$4.32 per pound were paid, or more than \$8,600 per ton—drawn wire, largely used in the construction of piano and other musical and mechanical instruments. Among these specimens also was piano wire at a market price of \$21.60 per pound, or \$43,200 per ton; it took 754 hair springs to weigh an ounce of 437½ lbs. 27,000,000 of these were required to make a ton, and, making one to be worth $1\frac{1}{2}$ cents, the value of a ton of these little things ran up to over \$400,000. The barbed instruments used by dentists for extracting nerves from teeth was even more expensive, representing some \$2,150,000 per ton.

CRACKING CAR WHEELS BY HEAT.—Some experiments made at the Altoona works of the Pennsylvania Company show that the chilled cast iron wheels so commonly used for freight cars in the states are liable to be cracked from the heating of the tread, arising from a long continued application of the brakes. Several accidents having occurred on heavy grades owing to wheel failures, it was determined to investigate the matter experimentally. To this end the wheels to be tested were placed horizontally in a sand mold, a space of one-half inch being left between the rim of the wheel and the interior of the mold. On pouring molten metal into this space, one of the three wheels tried cracked in 40 seconds; a second wheel failed in two minutes, whilst a third wheel made at the Altoona shops withstood the test perfectly.

RAILWAY WORKSHOPS IN JAPAN.—Recent advices from Japan indicate that the establishment of a large factory for turning out the rolling stock required for Japanese railways, is under serious consideration. The native papers are discussing the subject, and point out that even with the present mileage there is a deficiency of rolling stock, as compared with the standard of English railways. To the extent of 275 locomotives, 1,390 passenger cars, and 15,950 freight cars. They suppose that it is possible that the mileage in operation may be increased during the next 10 years to 20,000 miles, that is to about 10 times the present amount, and they calculate that if the rolling stock be purchased abroad, nearly 15 million yen will be required. If to this be added the funds necessary for other material, rails, bridges, etc., the exodus of money from Japan will aggregate an enormous total. In order to ward off this danger, arrangements are being made to establish workshops for the making of locomotives and cars in Japan, sending abroad in the meantime for the raw materials. It is proposed to establish workshops in Tokyo and Osaka sufficient, to begin with, to turn out 12 locomotives, 50 passenger and 200 goods cars per annum. In order to show the profits which may be expected, it is stated that in 1893 a four-wheeled locomotive, purchased by the Railway Bureau in Glasgow, cost 19,499 yen, and that if this locomotive had been constructed in Japan with material purchased from abroad, the cost would have been 13,369 yen, a difference of 6,130 yen. The writers on the subject claim that the working of the Kobe shops has demonstrated that a four-wheeled engine can be constructed in Japan some 6,000 yen cheaper, on the average, than in its cost if imported. They say that it arises from the fact that labor is five times better paid in England, than in Japan, although that difference is rapidly decreasing. It is clear that these calculations can be depended on, and that allowance has been made for interest on capital, cost of superintendence and profit, all of which are included in the price of the imported engines. However, as one of promoters of the company is Viscount Inoye Masaru, ex-chief of the Railroad Board, and as he is supported by well-known financiers who are not in the habit of throwing away their money, it may be assumed that they have gone carefully into the matter, and that the prospects of a good return for their money are promising. Manufacturers should take a note of these facts, for the Japanese seem anxious not only to make locomotives for themselves, but also to meet the demand which is certain to arise from China.

PILE DRIVING THROUGH STONE.—In a paper recently read before the American Society of Civil Engineers, Prof. W. H. Burr described some experimental pile driving through new stone-filled crib work. Nineteen piles were driven. The crib was 35 ft. deep, and the piles, from 52 ft. to 60 ft. long, were shod with chilled cast iron points, held on by straps spiked to the pile. The hammer used in

the driving weighed 3,500 lbs., and the greatest number of blows was 350. There was no difficulty whatever in driving the piles, and there were no failures. In the discussion following the reading of the paper several other gentlemen gave particulars of pile driving through loose rock. The shoe used in the work of the New York department is conical, the angle of the cone being about 60 degs. The base of the cone is flat, and it is secured to the cone by a pin cast as part of the shoe and let into the end of the pile. This type of shoe is said to have proved very satisfactory in practice.

CURIOUS LOCOMOTIVE EXPLOSION IN PERU.

A writer to the Scientific American has furnished that journal with a photograph of a locomotive taken after the explosion of her boiler; an accident which took place on the Lima & Chorrillos Railway (Peru) on April 8. The engine with some seven or eight well filled coaches, was at the station of Barranco where a crowd of passengers awaiting the train, had gathered. On starting, the boiler burst, with result as shown in photograph. Some pieces of the wreck were thrown to a great distance, and the shock was at a distance of three miles. Although this oc-



CURIOUS LOCOMOTIVE EXPLOSION IN PERU.

curred in one of the streets of the town, there were but two or three persons severely injured. Considerable damage was done, however, to the walls and windows of houses in the vicinity of the railway station. The engineer and fireman escaped with a few scalds. The boiler seemed to blow out from underneath, and it is very remarkable that so little damage was done.

THE APPRENTICE BOY.*

Your committee believes the necessity of the times changes the environment of the apprentice as well as the mechanic. With the passing of the small shop with a few boys, bound under written agreements and bonds signed with legal formality, there must be a new era for the apprentice.

We see with the modern corporations a breaking down of the old method of shop organization, suitable for the fathers and grandfathers, but no longer suitable for progressive organization. While in the past it may have been possible to hold a boy bound under agreements, such methods do not answer with great corporations such as our railroads are fast becoming, extending through several states, with their aggregation of shop employees gathered from the heart of great cities, from the suburban districts, and sometimes from small villages which are almost dependent on the corporation for their existence, the bond gives way to a comity. The boy is taught fidelity, and is given examples in the principles of loyalty, and the time is fast approaching when the young man will feel a loyalty to the corporation second only to the state or church. To bring about this is the duty of men handling large bodies of workmen.

Your committee, with a view of learning what could be done to improve and systematize the technical training of the apprentice, got into communication with several educational institutions, and sent out circulars asking a series of questions.

*Report of committee of the Master Mechanics' Association at Saratoga.

To the question: "Will the shopman of the future be simply an operative, and has evolution evolved a handy man who has come to stay, in the form of a skilled laborer, standing between mechanic and common laborer?" To the first part of the question there are a large number of replies in the affirmative, yet the majority think there will always be a large field for the skilled mechanic, and belief that the handy man and the special tool man has come to stay is very general, and they should be recognized and classed.

To question three, we believe Mr. Sanderson, of the N. & W. gives the best answer, and would suggest a general adoption of his suggestion, viz., to class mechanics as is the common practice in marine matters; the full fledged mechanic might be distinguished as an able mechanic, the special tool man or skilled mechanic as an ordinary mechanic.

Replies indicate some large shops employ as much as 50 per cent apprentice labor, while others indicate as low as one per cent, but from a careful study of the replies your committee think that with the ordinary railroad shop the best results are attained with one apprentice to five able mechanics.

Replies indicate that such shops as carry on a large amount of manufacturing employ a larger class of this help, and the shops of the east use a larger per cent of such help than the same in the west.

insure the success of a plan of supervision involving conditions somewhat as follows:

1. A permanent committee of members of the A. R. M. M. A. on apprentice schools.

2. The selection by the committee of a number of representative schools of high standing in engineering work, each of which shall be requested by the committee to act with other institutions selected, first, in organizing and after in supervising the work of apprentice schools.

3. The assignment of a definite territory to each college or university cooperating, said college or university to assume the supervision of all apprentice schools which may be established within its territory.

4. If, after the system as first organized by the committee has become operative, other schools of approved standing shall express a willingness to assume a share in the supervision of the apprentice schools, such institutions may, at the discretion of the committee, be given a territory, said territory to be deducted from that previously assigned to some other institution or institutions, to the end that there may be secured the fullest cooperation of the educational institutions of the country.

5. Each college accepting the responsibility of supervising a territory, would place each apprentice school for which it is responsible, in the charge of some member of its faculty, who would become responsible to the college authority for the work of the schools assigned him. For the purpose of this outline persons thus detailed will be hereafter referred to as the "College representative."

6. It would be the duty of the college representative to attend the organization of each apprentice school for the purpose of advising with the school instructor, and to assist in awakening enthusiasm among the pupils.

7. It would be his duty also to make trips of inspection to all apprentice schools under his charge at intervals of not more than three months for the purpose of examining the school as progress made and to advise with the instructors as to future work.

8. To be ready at any time to respond to the call of instructors of apprentice schools under his charge, by sending them mailed directions or advice; or, in case of special need, by a special trip of inspection.

9. When any subject or subjects shall have been completed by an apprentice school, the college representative having the school in charge would conduct an examination and report results to the office of his institution. Students who successfully pass such examination shall be entitled to a certificate issued under authority of the college having jurisdiction, which certificate shall be at any time accepted at the college by which it was issued, or by any of the cooperating institutions, as a full credit for the line of work which it covers.

10. It would be understood and agreed that the authority of the college representative would be advisory only. He will not seek to deal with details excepting as he may be requested to do so.

11. The cooperating institutions would make no charge for the supervision except to cover traveling expenses of the college representative.

(Note.—The undersigned is authorized by the president of Purdue University to say that Purdue will agree to undertake the supervision under conditions above specified, of any apprentice schools which are, or may be organized in connection with railroad shops located within a radius 300 miles from Lafayette, Ind.)

3. *The Course of Study and Practice.*—Time, Three Years; Two Evenings a Week.

First Year.—Subject: arithmetic and drawing.—Much that is usually taught under the head of arithmetic might be left out altogether or deferred until the corresponding topics are reached in algebra. The topics selected for treatment would preferably be the following: common and decimal fractions, denominate numbers, percentage, interest, ratio, proportion, square root with applications, similar volumes, convex surface and volume of solids, metric system of weights and measures, greatest common divisor and least common multiple. Examples for practice in these topics should be taken from the familiar facts of the shop and clothed in simple every-day language. Such examples constructed expressly for the class of men to be reached should shun, for the most part, the stereotyped forms based upon the store and counting room.

The drawing should consist chiefly in geometrical construction, so that while the use of drafting instruments is being acquired, the students may eat at the same time making progress in the study of geometry. It would perhaps be well to base the work upon Spencer's "Inventive Geometry," a little book well calculated to stimulate the ambitious student to do much valuable work at home.

Second Year.—Subjects: algebra and machine drawing.—The mathematics of this year would consist in a thorough mastering of arithmetic and a study of algebra through quadratic equations.

The drawing should develop the principles of simple projection and give practice in machine drawing, from copy and from detail of actual machines.

Third Year.—Subjects: higher algebra, geometry and drawing.—The algebra of this year would include, binomial theorem; logarithms, infinite series, progressions, solution of higher numerical equations, etc.; and in studying some of the elementary properties and applications of continuous number. During this year formal geometry should be pursued and rigorous demonstration of geometrical truth insisted upon. Geometry thus undertaken would clarify the mind for invention and strength it for logical and consecutive thinking.

The time for drawing this year should be divided between machine drawing and the solution of problems of a severe nature in projective drawing.

If the apprentices are bright and unusually quick, it is not necessary that three years be consumed in mastering these

To the question: "What is your apprentice system?" the replies are such that the committee believes that it would be useless for the association to recommend an apprentice system.

The replies are gratifying in the large number of evening schools in mechanical drawing and mathematics that are conducted at various points, with as many different methods as there are schools, and a large amount of waste energy, from the fact that when the course is complete it does not tie on to any other course for further advancement, and leaves the student's efforts suspended in the air with little or no probability of getting credit for his labor should he desire to continue his studies in an engineering institute.

Herein your committee believes there is opportunity for this association to render valuable assistance to the young men now endeavoring to make their mark in our profession, and in order not to make their work unwieldy, we have selected and here reproduce suggestions from the faculty of Purdue University.

PURDUE UNIVERSITY }
LAFAYETTE, IND., March 10, 1896. }

An Outline of School Work for Shop Apprentices.

DEAR SIR—In compliance with your request I send you the following outline concerning the organization and management of schools for shop apprentices, all of which, I trust, will be of service to you.

1. Administration.

The administration of the school should be in the hands of local talent. It is believed that every shop which gives employment to a sufficient number of apprentices to warrant the organization of a school, will have on its drafting room or office force, some one or more persons capable of giving the necessary instruction. In order, however, that the instruction may be made as systematic as possible, and that its value may be recognized by institutions of standing, it is proposed that the work of local instructors be subject to the supervision of certain technical schools.

2. Plan of Supervision.

It is probable that the cooperation of a sufficient number of the larger technical schools can be secured to

subjects. In a majority of cases, however, that amount of time would be found necessary. Where either the ability or previous preparation of students will allow, this course can be extended under the direction of the college representative. It is expected only that the students, with whatever preparation they may chance to have, will fall in line as rapidly as convenient, and having made a start will advance into the various subjects in the order indicated. A year's work as here defined may in some cases require two years, or in others may be done in six months.

Prof. C. A. Waldo, in charge of mathematics at Purdue, has given careful attention to the possibilities along mathematical lines, and the proposed course as above given is largely the result of his deliberation.

I will add that Purdue University is about to issue a circular setting forth the conditions under which apprentices or skilled shop men may be admitted to regular courses in our engineering department. When this is issued I will send you several copies.

I must apologize for the length of this epistle. You will see that many of my suggestions under the head of "Supervision" are matters which you proposed to me. Inasmuch as there is involved an agreement on the part of Purdue, I have thought it best to spread the whole matter just as though we had not discussed it. Yours very truly, W. F. M. Goss.

Your committee also had a long correspondence with the extension department of the University of Chicago, and had a meeting with Mr. I. H. Howerth, class study secretary, which resulted in Mr. Howerth addressing your committee as follows:

THE UNIVERSITY OF CHICAGO,
CHICAGO, March 11, 1896.

DEAR SIR—Since meeting with your committee, the matter we discussed has been presented to the president of the university, and to the director of the department of university extension, and I find that they look with favor upon the scheme outlined by you, and tentatively agreed upon by the committee. The university is disposed to join heartily into any feasible plan for providing instruction for railroad employees. Such a plan may possibly need

if one could be provided at a reasonable expense?" replies are varied, but your committee believe much interest can be awakened by the heads of the mechanical departments taking a very little interest in the matter.

We find there is quite an awakening in some sections in reference to the benefits to be gained through railroad men's Y. M. C. Associations, but your committee would also call attention to the courses of instruction offered by the University Extension of Chicago on the lecture study plan, and believe many lecture centers could be established to include large numbers of railroad men on such subjects as general history of philosophy, development theories of rates, combination investments, speculative management, state ownership or control, financial history of the United States, Karl Marx's "Political Economy," tariff history of the United States, and such other courses as they may be prepared to offer.

We would also like to call attention to the proposed organization of the Purdue Mechanics' Institute. Many of you have received circulars sent out in this cause, and it is to be hoped this movement will receive such a warm response by members residing in the central western states as to assure its success. As it is stated in this circular, it is proposed to make the lectures valuable from a purely technical point of view, and at the same time by abundant illustrations to render them sufficiently popular to interest all who may attend.

This association is composed of the busy men on the railways to-day, and men who have come to the front by the force of their own character, yet so many stand ready to give a helping hand to those who can be benefitted by their assistance.

THE LATEST IN STEEL CARS.

The Pennock steel cars, built by the Universal Construction Co., of Chicago, have been so fully illustrated in these columns that no further explanation of the special features of their construction is necessary except as regards the development of the ideas into different types of cars. It was noted in the

sidered the possibility of deepening the sides and providing large movable panels or doors for shoveling the coal out without the necessity of raising it over the sides. These cars have already been put into the coal trade and are now being loaded. They are equipped with Westinghouse air brakes, National hollow brake beams and the Tower M.C. B. couplers.

AMERICAN IDEAS APPLIED UPON BRITISH TRAINS.

The railways of the United States have grown up surrounded by special conditions not to be found in other countries and which have operated to cause differences in matters of construction of road and equipment from what is the usual practice in other countries. The development of new devices and attachments for rolling stock has been much more free here where encouragement is offered for the introduction of improvements. There is a marked tendency at the present time to introduce American ideas into English practice, and among the recent designs of trains there are several distinctively American devices. Early in June the first dining car was put into service upon the Great Western on the line between London and South Wales, and it is stated that they will soon be put into service on the lines to the west of England. The Great Northern has built two first and third class dining cars for running between London and Leeds. These are carried on six wheel trucks and have the Gould vestibule and automatic couplers. The length of the first class car is 62 ft. and that of the third class is 66 ft. They are both 9 ft. wide and 13 ft. 4½ in. high. A contemporary publishes the statement that the North Eastern Railway has just brought out a new train for its local service which is mounted on



TWO NEW PENNOCK STEEL CARS—UNIVERSAL CONSTRUCTION COMPANY.

further consideration than we have been able to give it. I think, however, that the following proposition is one which we should be able to carry out:

If the Master Mechanics' Association, through responsible parties, will assume the entire responsibility of organizing classes, providing rooms, furnishing free transportation, and the expense of board for the instructor, and will agree to furnish at least three circuits of six centers each, each center to take a course of 12 evening lectures at the price of \$50 for each course, the university will provide a competent instructor and direct the work. Assuming that each class is limited to 30 members, and that it would bear the expense of board for the instructor, and estimating that expense at \$18, the expense to each member of the class would be \$2.26½ cents, or a fraction over 18 cents a lesson. This proposition, of course, involves a guarantee on the parts of the roads of \$900 for the first year's work.

We are anxious, if we undertake the work, that the instructor be a first-class man, and we think that such a man could hardly be secured unless we are able to guarantee a certain salary.

You will understand, of course that it will be necessary to arrange the centers so that it will be possible for the instructor to go from one to another without spending too much of his time upon the road.

Hoping that the above suggestions may meet your approval, and asking you to be kind enough to write me what you think of them, I am,

Very truly yours,
IRA H. HOWERTH,
Class-study Secretary.

We have selected these two communications, not wishing to ignore others, but think if the work could be undertaken in a small circle it might be enlarged as circumstances and success would warrant.

In reply to the question, "Do you believe your apprentice boys would take an active interest in a night school

RAILWAY REVIEW of last week that five steel cars were on exhibition by this company at the Lake Shore & Michigan Southern Station in Chicago, and an illustration has been prepared from a photograph of two of the newest designs of the gondola type, of which the first two have just been completed. These cars differ only in the application of eight apron doors to one of them for the purpose of unloading ballast or other loose material. These doors are 12 in. high and the length is that of the panels between the stiffening angles. The illustration shows the construction of the doors and the form of hinges and fastenings employed.

The cars are 34 ft. long by 8 ft. 6 in. wide, the height above the rail to top of the sides being 7 ft. 2 in. The plain gondola weighs 30,650 lbs., and the car illustrated weighs 31,000 lbs. both being equipped with Haskell & Barker trucks, weighing 12,600 lbs. The cubical contents of these cars is 952 cubic feet each, which, taking iron ore at 160 lbs. per cubic foot and sand at 95 to 100 lbs. per cubic foot, would give them a capacity of about 150,000 lbs. of ore and about 100,000 lbs. of sand or ballast. The sides of the cars are not depended upon to carry the load, but merely to confine or enclose it, and this permits of cutting the sides and ends, also, if necessary, for fitting doors to facilitate unloading. The underframing is that of the Pennock flat car, composed of special rolled channels of steel plate and the gondola sides and ends with their stiffening angles are added. The nominal capacity of these cars is 80,000 lbs. and they will carry about 60,000 lbs. of coal, when heaped up as is usual in loading. The manufacturers have con-

sidered the possibility of deepening the sides and providing large movable panels or doors for shoveling the coal out without the necessity of raising it over the sides. These cars have already been put into the coal trade and are now being loaded. They are equipped with Westinghouse air brakes, National hollow brake beams and the Tower M.C. B. couplers.

"The East Coast completely new day trains, 530 ft. long, 270 tons in weight, and carrying 300 passengers will represent the highest attainment of this country. The train belonging to the joint companies, and constructed at Doncaster under the direction of Mr. E. F. Houlden, consists of eight coaches, each carried on two six-wheeled bogies, the height of each vehicle being 13 ft. 5 in. from the rail level. The four center carriages are of the composite corridor type, now very popular on this route, and they are 66 ft. 10 in. long by 8 ft. 6 in. wide. At either end of them are third class carriages, the one on the corridor principle and 65 ft. 10 in. by 8 ft. 6 in., taking 54 passengers, while the other assimilates more to the American type, there being an open passage in the center, and only three divisions, holding respectively 23, 16 and 15 passengers; but otherwise the carriage is open with end doors. An ordinary brake van, 62 ft. 7 in. long at either end completes the Edinburgh train. The most novel feature, however, is the adoption of Gould's automatic coupling and vestibule, and also the use of the Westinghouse quick-acting brake. The coupling is on the principle adopted in the states and in other countries, and not only obviates the necessity of manual work between

the carriages in marshaling trains, but is of great strength, the pull required to break the coupling being 130,000 lbs. Again, the vestibule provides a continuous platform and a central buffer; the ends of the carriages being curved, there is a greater resistance against carriages telescoping or mounting. The central buffer too, provides great elasticity in taking curves. The vestibules are 3 ft. wide and 6½ ft. high, and they are such that passengers will be able to go through without any fear. The Westinghouse quick-acting brake has stopped trains greater in length and weight than these new "Flying Scotchman", while going 60 miles per hour, within 500 yards. The cars have clerestory roofs, torpedo ventilators, double gas lights, Gold's steam heating apparatus and electric bells, so that even the third class passenger may call the attendant to bring tea, coffee and light refreshments en route. The compartments are trimmed with combination velvet in crimson and black, with silk laces to match, and on the walls of the corridor are maps, etc., of the route. The cars are as substantial as they are elegant. The bodies are of selected teak, varnished, picked out with gold lines, and the route and the destination are very prominently marked. It may be added that all three companies running to the north are fitting on new and exceptionally powerful locomotives, those of the Caledonian, for instance, having 1,403 sq. ft. of heating surface. They have taken trains of 19 and 22 coaches single handed over the Beattock rise."

These trains are 530 ft. long over all, they accommodate 300 passengers and weigh 270 tons. Beside the Gould vestibules the cars are provided with the standard British side buffers, so that the ordinary cars may be coupled to them when desired. These buffers are ordinarily drawn back out of contact and are only put into use when necessary. All of these improvements indicate a willingness to take advantage of good ideas of foreign origin, and in addition to these an important innovation yet remains to be adopted in the form of larger and more suitable locomotive cabs, which will furnish proper protection to the engine crews.

TOOL ROOMS IN MACHINE SHOPS.

A committee of the Central Railway Club submitted a report upon "Tool rooms in machine shops and the best methods of handling them," from which the following abstract is taken:

An eminent engineer once said, "Show me your grindstone, and I will tell you the character of the work which you turn out." In the same way I think it can truthfully be said, "Show me your tool room, and I will tell you the character of the work which you turn out." In order that the tool room may be a success, the man placed in charge of same should be carefully selected. He should have had considerable experience—the more the better—in the making of tools, neat and orderly in all that he does, and a man who thoroughly appreciates the necessity for preserving standards, as the preservation of many standards depends largely upon the proper maintenance of the tools ordinarily kept in a well regulated tool room. A tool room if well handled by such a man, will insure that the tools have proper care, and can be found when required. It also makes it possible to collect together tools that have become obsolete, so that they can be condemned, or altered, to suit the standard requirements.

The location for the tool room depends largely on the general arrangement of the shop, but the tool room should always be located so as to have good light, and the location should be a central one, taking into consideration where the men work who use the tools to the greatest extent. If there is sufficient space, the tool room should be located outside of the shop proper, with a large opening between them, as a tool room located in the body of a shop is an obstruction, and is objectionable both from a practical and an aesthetic point of view.

All standard tools that are in general use, and are required to be kept to standard sizes, should have a place in the tool room. This would naturally include taps, reamers, drills, dies, templates, jigs, ratchets, clamps, calipers, etc. In addition, all tools in general use that require special adjustment, should be kept in the tool room, such as hydraulic jacks and pneumatic tools. Your committee believes that the tool room is the proper place for lathe tools, planer tools, and chisels, over and above a certain number to be kept at each machine, or by each floor hand, as may be determined upon by the master mechanic of the shop. The tool room is also the proper place for all test gages. A tool room should be equipped with shelving and racks, not located against the wall, the shelving being inclined at such an angle as will permit each tool to be readily seen by the men in charge. The shelving should be divided up by strips, so that each tool will have its own particular place, and prevent damage on account of the tools striking together. The tools should be arranged in the pockets made by the strips, so that tools of about the same size will be kept together. The racks should be so arranged that they are readily accessible from either side, and can be reached without interfering with the work at the machine tools that may be located in the tool room, and the shelving should be arranged so that the larger tools can be kept on the lower portion of the same. In addition to the racks re-

ferred to, one or two revolving racks should be provided adjacent to the window from which the tools are handed out, on which revolving racks the smaller tools can be kept, so as to facilitate their delivery to the workmen. Shelving and hooks should be provided for the templates, and gages, also a rack for pipe tongs, straight edges, etc. No cup-boards should be provided for the tool room, except those actually required for the wearing apparel of the workmen connected with the tool room, as otherwise the cup-boards will soon become receptacles for material that does not properly belong in the tool room.

The machine tools to be placed in a tool, depends largely upon the size of the shop, and the policy of the management as to manufacturing taps, reamers, etc., or buying them outside. For a medium sized plant, your committee thinks the following equipment of machine tools advisable:

Engine lathe, with taper attachment.
Universal milling machine.
Emery wheel, running in water, for grinding tools.
Universal grinding machine.
Twist drill grinder.
A small drill press.

Bench with two vises, located where the light is good. If the size of the plant will warrant it, your committee also recommends that there should be a tool dressing fire near the tool room, together with a small power hammer, at which fire the dressing of all tools should be done, and with this report are submitted two drawings showing different arrangements for the location of machine tools, racks, etc., in tool room, either of which, the committee thinks, might prove satisfactory, according to the size of the plant, and the nature of the work to be done in the tool room.—[One of these is shown in the accompanying illustration.—ED.]

For plants that employ more than 250 men, your committee recommends the following general arrangement for the distribution of tools to the workmen:

A list of all workmen entitled to obtain tools from the tool room, should be printed alphabetically, and each name should be numbered in consecutive order. The list should be neatly framed, and hung up in the tool room near the delivery window. Each workman whose name appears on the list, should be furnished with six brass checks, each check bearing the number that is opposite his name on the printed list. At the outer end of the pocket provided for each tool, there should be a wire brad or nail, so that when a tool is taken out, a brass check bearing the number of the man who has the tool can be hung up on the brad, which will indicate what workman has that particular tool, and it should be the invariable rule to have all tools returned to the tool room at the end of each week, so that they can be examined by the man in charge, and prepared for delivery at the commencement of the next week, as may be required. The delivery of the tools to the workmen should be accomplished in the following manner:

An electric annunciator should be set up in the tool room in some convenient location, with buttons located at different points in the shop, where they will be the most convenient to the men in the different departments. There should be a small blackboard at each button, divided off by five or six horizontal lines, with a brad or wire nail at the left hand side of each space made by the lines mentioned. When a workman wants a tool he, should push the button, then write on one of the spaces in the blackboard the name of the tool required, and hang his tool check on the nail opposite that space. There should be two or three boys in the tool room, one of whom should go to the station rung up on the annunciator, remove the tool check, see what tool is required, bring the check to the tool room, hang it up in place of the tool, then take the tool to the blackboard where the workman can get it. In order to prevent delay, and to carry out this scheme successfully, the workmen should not wait until they actually want a tool, but should anticipate their wants, so that the tool can be brought to them by the time it is required. The returning of the tools to the tool room can be handled in the same way as the delivery of the tools to the workmen, provided the boys who distribute the tools knows where each tool belongs when it is returned. With this arrangement, boys paid from five to six cents per hour, can attend to the distribution of the tools, rather than having the workmen do it, who receive a much higher rate of pay, and your committee believes that where the annunciator is not used, the tool room is a good excuse for the men loafing, the same as the grindstone. One member of the committee was recently in a large railroad shop, and noticed eight workmen standing around the tool room window waiting for tools. Obviously the annunciator system would be a good thing for that shop.

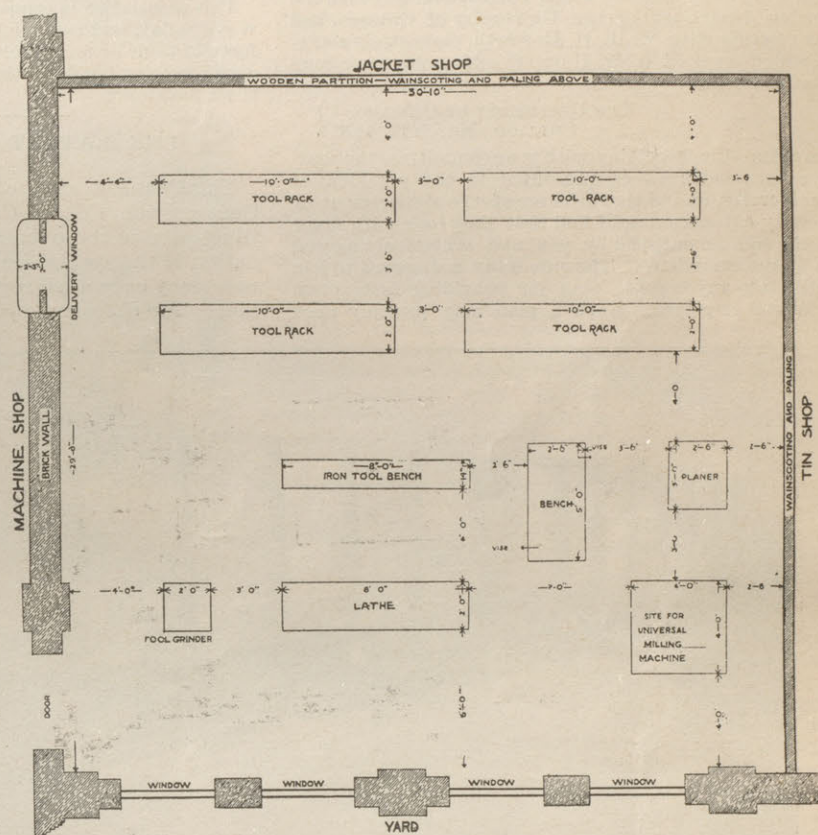
SMOKE PREVENTION AND MECHANICAL STOKERS.

In a paper recently read before the Civil Engineers' Club of Cleveland and published in The Journal of the Association of Engineering Societies, Prof. C. H. Benjamin presented a view of the mechanical stoker from a mechanical standpoint with reference to economical smokeless combustion from which the following is taken:

Quite a number of experiments were made several years ago on very black, dense smoke. It was all collected and the amount of solid matter was determined by weight. It was found to be in all one-third of one per cent, or 1-300 of the weight of coal burned in that time. Probably one half of this solid matter was carbon, showing that the amount of coal which is actually wasted in soot is 1-600 part of the coal. This shows that there is no economy in burning smoke, as far as the manufacturer is concerned. It is his neighbor that would profit by the change.

In preventing smoke the principal requirements seem to be:

1. That the coal shall be evenly heated.
2. That there shall be a free supply of hot air raised to the temperature of combustion.
3. That the volatile matters distilled from the coal shall



ARRANGEMENT OF A TOOL ROOM.

pass through gases of such temperature that they shall be burned, so it shall be impossible for these gases which distill from the coal to escape by the chimney, or to become cooled after once having been ignited.

The great mistake that many manufacturers have made in trying to invent a smoke preventing device by the introduction of air about the fuel or at the bridge wall is that they have not made their air hot enough. The introduction of cold air is a disadvantage rather than an advantage, as far as preventing smoke is concerned. It will produce smoke where none existed before. There are a number of stokers on the market which, under ordinary conditions, with uniform firing by a careful fireman, will operate to prevent smoke successfully and with good economy. These different types of stokers all have a common principle, that of maintaining the thickness of the fire uniform, and of supplying the air either by means of steam jets or otherwise at a high temperature above the coal, and insuring that all the volatile matter shall pass through a hot place on the way to the chimney.

One of the more common forms of stoker consists of two inclined grates, all the gases being obliged to pass over the incandescent coal before escaping into the chimney, and the clinkers being deposited on the bottom.

Another type has a coking plate at the upper end, and one inclined grate running lengthwise of the boiler. Both have shaking grates.

Still another device consists of traveling grate with an endless chain over two pulleys and a coking course at the front end, the gas passing over the incandescent coal on the way to the boiler.

There is an underfed stoker, where the coal is placed in the ash pit and forced up through grate, this being the same as our ordinary base burner, only the other side up.

One other type is the so-called down draft furnace, which is not a mechanical stoker, in one sense of the word, but consists of water grate connected to the bottom of the boiler by risers, at the rear, usually having a drum at the connecting point, and a supplementary grate underneath on which the half burnt coal is dropped and the combustion completed. Most of the air is obliged to pass over the grate down through the fuel, a small amount of air being admitted underneath. The principle of all these

is the same, that of supplying air at a high temperature and forcing the volatile matter to pass over incandescent fuel.

I presume that there are other varieties that will work under ordinary circumstances with good results, and give good economy. The steam jet is applicable to all of these, and is used in many of them as a means of introducing air at a high temperature.

The great difficulty with all mechanical stokers is the fact that in many establishments there are very sudden demands for steam pressure, and there is a possibility of its being necessary to double the amount of steam used inside of fifteen minutes or a half an hour. Many stokers are not adapted to that kind of treatment. This is one reason why they have failed of adoption. A stoker cannot respond so readily to a sudden demand for more steam. I will say, without prejudicing any of the other stokers, that the down draught furnace is the most successful stoker for all such emergencies. It involves the use of hand firing, the coal being fed to the grate the same as to any grate. It allows the same treatment as the ordinary open grate, and the fireman has the same liberty that he would have on any grate. In a paper read by two experts, of St. Louis, last year, it was stated that in their opinion this form of grate was best adapted to cases where there were sudden demands for large amounts of steam, and great fluctuation of the pressure and consumption of steam. They said that this form of grate had done a great deal to diminish the amount of smoke made in St. Louis, where they are more unfavorably situated than we because they do not get as good coal.

I will mention what seems to me to be the requirements of a good smoke preventing device:—

In the first place, variable feed. It is necessary that it should be possible to vary the feed of the stoker quickly and conveniently. In the second place, it is necessary that the spacing of the grate bars should be variable; that the air spaces between the bars may be varied, and the coarseness or fineness of the grate may be quickly adapted to the particular kind of coal used. Third, it is necessary that the grate bars should be of the automatic shaking type, so as to prevent the formation of clinkers and facilitate the dropping of the ash. Some form of air control is quite important. Almost any form of stoker or grate under hard service needs a high chimney. The great difficulty in many of our establishments is that the chimney is not high enough and the draft not powerful enough. There should be a margin, and the fireman should have the means of controlling it. If there is not enough draft, the fireman cannot do anything; if there is too much he can easily reduce it. It is impossible to get good results with a small grate. A grate which is large enough under ordinary conditions is not large enough under sudden emergencies. In order that a stoker may commend itself to a purchaser, it should be easily accessible for cleaning and repairing, and it should be so located that it can be taken out and replaced without tearing out the whole front of the boiler. This is one of the serious objections to several forms of stokers which otherwise are very desirable. Where the feed water is pure, the water grate is a success, and where the feed water is impure, the water grate is not a success. Among the requirements in smoke prevention no item is of such importance as good firing. A good fireman can, with an ordinary grate, give good economy, and to a large extent prevent the formation of the smoke, if the boiler is not forced beyond its capacity. A good fireman is just as necessary with any form of stoker that has ever been used. The reason why so many chimneys smoke is partly because there is not enough firemen and also because there is not enough boiler.

It has been claimed by opponents to mechanical stokers, or to any form of furnace which is intended to prevent the formation of smoke, that it is impossible to realize the full duty of a boiler when equipped with such a device. I know from my own experience that that is not true. I have made experiments with one form of stoker, and continued them for several years. I found it entirely feasible to double the rated capacity of the ordinary return tubular boiler without the formation of smoke. Of course, when the fire is being cleaned, there is a little smoke. But during ordinary combustion there is no smoke except the blue smoke, which is due to impurities. It is possible to double the ordinary rating of the boiler without smoke, with an ordinary mechanical stoker, and to expect more than this is unreasonable. With hand firing you cannot go beyond this without making smoke and without limiting the life of the boiler. It has been found by repeated experiments that such attempts are made at the expense of the boiler.

Summing up then, I will say the principal requirements for the prevention of smoke are the adoption of a device which shall best be adapted to the particular situation; second, a chimney of suitable size and height; third, a boiler which is at least half as big as it ought to be; and last but not least, a fireman who is worth more than \$1.50 a day.

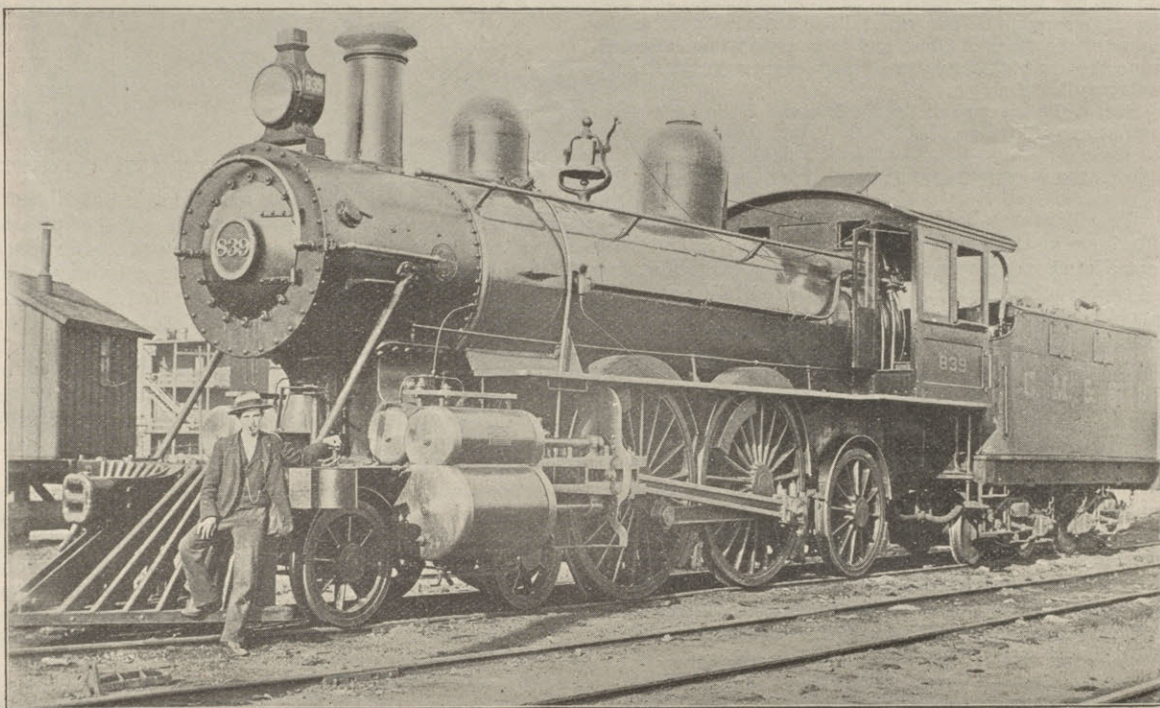
The application of steam jets, if not overdone, I have found valuable. But there is a tendency to use too much steam. The direction of the steam jet must be very carefully looked to. If they impinge on the boiler or on the grate, there is danger of injury. I have seen instances when the fire was smoking below and the steam jets were turned on, the smoke was cut off as if cut with a knife. One great advantage of the mechanical stoker consists in the fact that if it is provided with a hopper the rush of cold air over the grate is effectually prevented, whereas in any form of hand firing when the doors are open, if only for an instant, smoke is formed. A sudden draft of cold air is also one of the most potent means of destruc-

tion for the boiler, and is liable to make itself felt very suddenly when you least expect it.

With regard to the skill required in manipulating the stoker, it is a different kind of skill from that required in handling the shovel. It requires more mechanical ability. Another advantage of the mechanical stoker is that one man can attend to more boilers in a given time. If the stoker works as it should, I think a boy could run it. But unfortunately stokers have their ups and downs. If your coal dealer should impose upon your good nature and send you a few carloads of bad coal, you will find that you need a skilful fireman to keep your stoker in order for the next two or three days. These are the times when you need a \$3 day fireman.

NEW PASSENGER LOCOMOTIVES—C. M. & ST. P. RY.

The accompanying illustration, which was prepared from a photograph received through the courtesy of the passenger department of the Chicago, Milwaukee & St. Paul Railway, illustrates one of two fast passenger locomotives which are now being tested in service upon that road. These locomotives



NEW FAST PASSENGER COMPOUND—C. M. & ST. P. RAILWAY.

are of the Vaucrain compound type. They possess a number of interesting features including the tenders, which will be described and illustrated in these columns after the completion of the trials.

Class of locomotive	10 38 1/4 C.
Gage of road	4 ft. 8 1/2 in
Cylinders, diam.	H. P. 13; L. P. 22; stroke 26
Driving wheels	78 in. diam
Total wheel base	25 ft. 6 in
Rigid wheel base	13 ft. 9 in
Driving wheel base	6 ft. 9 in
Weight, total	140,700 lbs
Weight on drivers	71,600 lbs
Weight on trailing wheels	29,100 lbs
Weight on truck	40,000 lbs
Boiler diameter	60 in
Number of tubes	264
Diameter of tubes	2 in
Length of tubes	15 ft
Fire-box length	103 3-16 in
Fire-box width	42 1-8 in
Fire-box depth	71 1-2 in. front, 69 in. back
Heating surface, fire-box	171 sq. ft
Heating surface, tubes	2073.5 sq. ft
Heating surface, total	2244.5 sq. ft
Truck wheels, diam	36 in
Truck journals	5 1-2 x 10 in
Trailing wheels, diam	54 in
Trailing journals	7 x 12 in
Tender tank capacity	4,500 gals
Tender wheels, diam.	33 in
Tender journals	4 1-2 x 8 in

National Railroad Blacksmiths' Association.

The annual meeting of the National Railroad Master Blacksmiths' Association will be held at Chicago, beginning at 10:00 o'clock, September 1, 1896 at the Tremont House. The indications are that the attendance will be large. A specially interesting programme of pertinent topics has been arranged. The members of the several committees have been quick to respond of their own accord relative to papers, etc. The importance of the work should appeal with such force to the members of the committees that a systematic effort should be made to have their papers in the hands of the chairman of their respective committees in due season so as to have everything in readiness for the proper dispatch of business.

Arrangements have been made for a rate of \$2.00 per day at the Tremont House, which will be official headquarters. Members will kindly notify Mr. John Buckley, of the Illinois Central Railroad shops, Chicago, Ill.,

whether they intend to attend the convention, also if they are going to be accompanied by members of their family, and how many.

Interlocking Statute in Ohio.

The following law has just been passed in the state of Ohio for the control of interlocking signal apparatus and its application to grade crossings and draw bridges. Some comments upon the regulations are given in the editorial columns of this issue.

Section 1. Be it enacted by the general assembly of the state of Ohio, that when in case two or more railroads, or a railroad and an electric railroad crossing each other at a common grade or any railroad crossing a stream by a swing or drawbridge, shall, by a system of interlocking, or by other works or fixtures, to be erected by them, or either of them, render it safe for engines or trains to pass over such crossing, or bridge, without stopping, and such system of interlocking works or fixtures shall first be approved by the commissioner of railroads and telegraphs, and a plan of such interlocking works or fixtures, for such crossing or bridge, designating the plan of crossing, shall have been filed with such commissioner, then, and in that

case, it is hereby made lawful for the engines and trains of such railroad or railroads, to pass over such crossing or bridge without stopping, any law, or the provisions of any law, now in force to the contrary notwithstanding, and all such other provisions of law contrary thereto are hereby declared not to be applicable in such case; provided, that the said commissioner shall have and is hereby given power in case such interlocking system or other fixtures, shall, in his judgement, prove to be unsafe or impracticable, to order the same discontinued, opportunity first being given the persons or company operating the same to be heard before said commissioner as to the propriety of such order. In case such order is made and enforced, the existing statutes relative to stopping at crossings shall apply until such time as a device approved by said commissioner is substituted.

Sec. 2. That in case where the tracks of two or more railroads, or the tracks of a railroad and an electric railroad cross each other at a common grade in this state, any company owning any one of such tracks, whose managers may desire to unite with others in protecting such crossing with interlocking or other safety devices, and shall be unable to agree with such others on the matter, may file with the said commissioner a petition stating the facts of the situation and asking said commissioner to order such crossing to be protected by interlocking, or other safety devices; said petition shall be accompanied by a plan showing the location of all tracks and switches, and upon the filing thereof notice shall be given to each company or persons owning or operating any track involved in such crossing, and the said commissioner shall thereupon view the site of such crossing, and shall as soon as practicable appoint a time and place for the hearing of such petition. At the time and place named for hearing, unless the hearing is for good cause continued, said commissioner shall proceed to try the question of whether or not the crossing shall be protected by interlocking or other safety devices, and shall give all companies and parties interested an opportunity to be fully heard; and after such hearing said commissioner shall enter an order upon a record book, or docket, to be kept for the purpose, granting or denying such petition; and in case the same is granted, such order shall prescribe the interlocking or other safety devices for such crossing and all other matters which may be deemed proper to the efficient protection of such crossing and in such order the commissioner shall designate the proportion of the cost of the construction of such plant, and the expense of maintaining and operating the same, which each of the companies or persons concerned shall pay, and shall also fix the time within which such appliance shall

be put in, such time, however, not to exceed 90 days from the making of such order.

Sec. 3. In case, however, one railroad company or an electric railroad company shall hereafter seek to cross at grade with its track, or tracks, the track, or tracks, of another railroad, the railroad company, or the electric railroad company, seeking to cross at grade shall be compelled to interlock such crossing to the satisfaction of the said commissioners, and to pay all cost of such appliance, together with the expense of putting them in and the future maintenance and operation thereof. Provided this act shall not apply to crossings of side tracks only.

Sec. 4. Whenever interlocking or other safety devices are constructed and maintained in compliance with section 2 or 3 of this act then and in that case it shall be lawful for the engines and trains of such railroad, or railroads, and the cars of such electric railroad to pass over said crossings without stopping; any law or the provisions of any law now in force to the contrary notwithstanding; and all such other provisions of law contrary thereto are hereby declared not to be applicable in such cases.

Sec. 5. Any person, company or corporation refusing or neglecting to comply with any order made by the said commissioner of railroads and telegraphs in pursuance of this act shall forfeit and pay a penalty of five hundred dollars per week for each week of such refusal and neglect, the same to be recovered in an action of debt in the name of the state of Ohio, and to be paid when collected, unto the county treasurer of any county in which such suit may be tried.

Sec. 6. This act shall take effect and be in force from and after its passage.

NEW BRIDGE OVER THE SEINE.

The Mirabeau bridge over the Seine in the city of Paris, near the Champ de Mars, which has just been completed, possesses a number of interesting features of construction which are illustrated in a recent issue of *Engineering of London*, from which the accompanying illustrations and information are taken. In the design of this structure, a high water clearance was desired for the passage of barges and moderate gradients were necessary, on account of the heavy traffic over the bridge. The problem was a complicated one, especially in view of the fact that at one end of the bridge a clearance of 15 ft. 9 in. under the approach was required over the rails of a line of railroad now being constructed. The designer was M. Resal, Ingenieur-en-chef des Ponts et Chaussées. The general appearance of one-half of the bridge may be seen in the elevation view. The bridge has a span of 325 ft. 11 in. between centers of

river. Considerable attention has been given to the beauty of the bridge and the curves are such as to conceal the appearance of weight of the structure and from a casual observation the method of pivoting at the piers would not be discovered, since low walls have been raised around the bearings. The construction of these bearings is shown in the illustrations.

The piers have a maximum length of 91 ft. 10 in. a width of 32 ft. 9 in. at the base. They are not symmetrical, a wider base being given on the side nearest the bank than on the side towards the river; this want of symmetry is not visible, as it is commenced only below the normal level of the river. The piers are not of solid masonry, but are built with chambers. It was found necessary to employ compressed air to get in the foundations, which were sunk to a

character. There were two air compressors, besides one held in reserve; one of these furnished air at a high pressure for the operation of the hoisting machinery, while the other delivered air at a lower pressure for the working chambers of the caissons. All the compressed air was heated before expansion, that for the working chamber to 50 deg. cent, by passing through a coil. The high pressure air was delivered into a steam boiler, where it was mingled with the steam and water before it was used. One installation was made to serve for both piers, and the same remark applies to the electric light installation. With a force of 12 men at the bottom of the caisson in the air chamber, and 20 masons the work proceeded as rapidly as was found desirable. The stonework is of a high character, and Portland cement is used throughout, except in

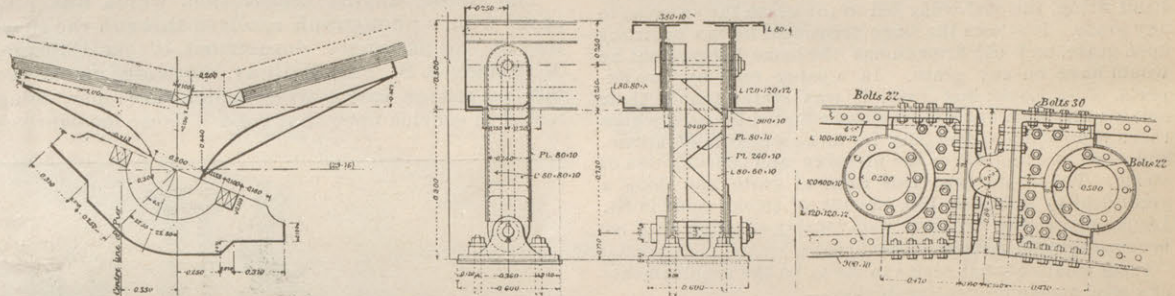
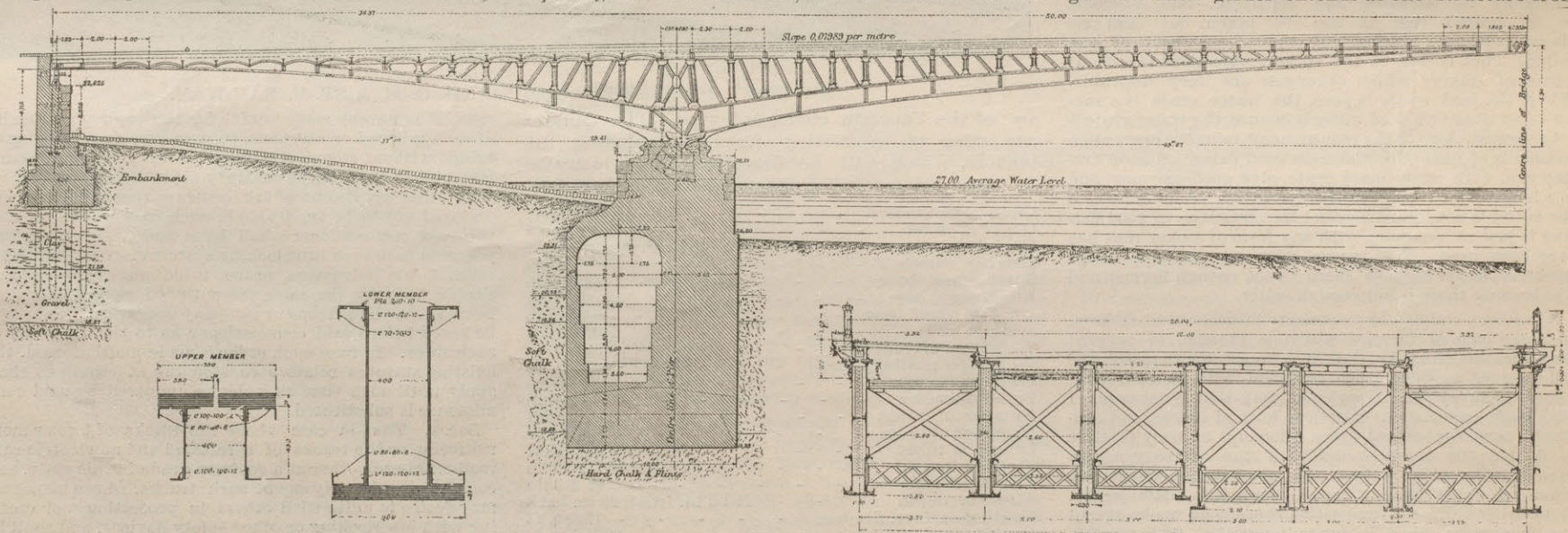


FIG. 2.—PIER PIVOT AND CONNECTIONS AT CENTER AND ABUTMENTS.

depth of 52 ft. 6 in. through modern alluvial deposit, sand and gravel, as well as through a bed of plastic clay, and a cretaceous stratum, before the compact flinty chalk that makes a reliable foundation, could be reached. The caissons employed had the same dimensions as the piers; they consisted of a fixed or permanent portion, and of temporary sections which were added as the work proceeded. For a height of 9 ft 3 in. the thickness of the plates of which the caisson was constructed was 0.31 in. for the lower section; the thickness of the upper section was increased to 0.20 in. in order to adapt it for the connections with the bottom length of the temporary part of the caisson. This latter was made in three lengths, respectively 0.2 in., 0.16 in. and 0.12 in. thick. The thickness of the plates forming the roof of the working chamber is 0.16 in., and the clear height of this latter was 6 ft. 6 in. There were four openings into this chamber, two of which were for

the working chambers, which are filled with concrete. The abutments present nothing special in their design or construction; they are carried on piles, and are chiefly of limestone set with hydraulic mortar. The section of one of the voids in the piers is shown in the elevation and sectional view, the center of which is 11 ft. from the center of the pier. Its depth is 29 ft. and the diameter decreases from 16 ft. at the top to 10 ft. at the bottom. The width of the pier above this series of chambers is reduced to 22 ft. which is the width of the portion seen above the water level. The abutments are very light having weight enough merely to furnish anchorage for the land spans of the cantilevers. It consists of masonry 13 ft. in width at the bottom reduced to 7 ft. above the level of the paved quay. The abutments are founded on piles and are 13 ft. high.

The superstructure is carried by two sets of seven girders. Each girder extends as one structure from



THE NEW BRIDGE OVER THE SEINE.—FIG. 1.—ONE HALF ELEVATION AND SECTIONS.

piers and a clear headway at the center of 25 ft. 11.5 in. The half spans at each bank are 121 ft. 5 in. long. This is not an arched structure in the true sense of the word, but consists of a series of balanced girders or cantilevers pivoted over the piers and anchored at the abutments. This bridge is triply articulated, on each of the piers and at the center of the main arch. Although in a general sense it can be described as being built in three spans, yet in reality it consists of two symmetrical sets of girders extending from the abutments, resting on the piers, and abutting against each other in the center of the main opening. The equilibrium between the two half spans is not exact and the piers take some of the thrust. The thrust is kept down by the relatively small weight of the center of the structure. It would otherwise be excessive on account of the small rise of the girders. There is a tendency to lift the shore ends at the abutments which is reduced by making these parts exceedingly heavy. The length of the short arms is three-quarters of the arms reaching to the center of the

the admission and the egress of workmen, the other two being for raising and lowering materials. These latter were on the Zschokke & Terrier system, in which the hoists in rising and descending, open and close the valves controlling the air locks automatically. This system of air locks is largely used on the continent, and it is claimed for them that they can be worked with great rapidity—an advantage which does not apply in the case of the air locks for the workmen.

The caisson (each of the two weighed 110 tons) was strengthened inside by a system of lattice girders to the number of 21, of which eight were used to carry the different air locks. The cutting edge at the bottom of the caisson is formed of steel plates 9.84 in. deep and 0.59 in. thick; these plates were attached to the sides of the caisson by means of brackets. There is little to say about the manner in which the work of the foundations was carried on, the usual familiar routine having been followed. The mechanical plant installed in connection with this part of the work was of a very interesting

the abutment to the center of the river, the total length being 285 ft. 4 in., unequally divided, as regards the point of support over the pier, into two arms, that from the abutment to the pier being 121 ft. 3.5 in. The rib consists of an upper and lower member, the former straight and laid with an inclination to the center of the bridge, corresponding with the gradient of the approaches; the latter with a parabolic curve. In the upper member the thickness of the flange is decreased from 3.15 in. over the pier to .39 in. at the ends, the thickness of the lower flange being practically the same, though the distribution is different, as is shown on the diagram. The depth of the upper straight member is 19.29 in., the width of the flanges being 31.10 in., divided into two sets of plates of 14.96 in. wide, and the webs, 15.75 in. apart consist of plates 19.29 in. deep, connected by angle irons 3.94 in. by 3.94 in. by .47 in. to the flanges, and stiffened at the lower side by similar angle irons. The lower curved member increases in depth from the ends, where it dies into the upper girder, to the piers. At the abutment

end this depth is 19.69 in., and at the center of the bridge 33.08 in. The flange of the lower member is 35.43 in. wide, and the webplates are 15.75 in. apart; these webs are stiffened at the top by two angles and plates 8.26 in. by .39 in. The lower member is stiffened by verticals dividing the longer arm into 11 panels, and the shorter arms into five panels to the points where it connects with the upper girder.

The structure is strengthened over the pier by additional stiffeners, two of which on each side are run diagonally down to the point where the cast steel bearing plate is bolted to the rib. The space between the curved and straight ribs is filled with posts and bracing. There are 20 posts in the longer arm and eight in the shorter arm; the bracing is diagonal, and is inclined from the pier towards the center, and towards the abutments, respectively. Over the piers the posts are of a heavier section, and the panel between them is filled with single intersection bracing. The five main girders that carry the roadway of the bridge are spaced at equal intervals of 9 ft. 10.11 in.; the two outer girders beneath the footways are 12 ft. 2.46 in. The total width from center to center of outside girders is 63 ft. 9 in.; the width of roadway is 39 ft. 4 in., that of each footpath is about 9 ft. 10.11 in., and the clear distance between the centers of the parapets is 65 ft. 8 in. The transverse connections of the bridge consist of a series of lattice girders attached to the bottom of the curved rib, of diagonal bracing and of rolled beams between the straight members of the ribs, between which are placed the arched floor plates carrying the roadway; the footpaths are supported by independent and inclined bearers.

The construction was made from a temporary staging upon which a traveling gantry was mounted which extended over the entire width of the bridge. The sidewalks are of asphalt laid on beton in cement 3 in. thick. The traveling gantry had a span of 85 ft. The riveting was done by portable hydraulic machines. There have been used in this bridge 2,744 tons of metal, of which 2,000 tons were rolled steel, 385 tons of wrought iron, 82 tons cast steel, and 48 tons of cast iron, besides 152 tons of decorative castings. Nearly 400,000 cu. ft. of masonry were laid, of which about seven-tenths were used in the piers. The cost slightly exceeded \$404,000, the cost of the steel superstructure being \$247,000. The maximum pressure on the foundations from dead load is well within the limits of safety. Under the most unfavorable conditions, when only the longer arms were fully loaded during an exceptionally high temperature, the pressure was found not to be excessive. A maximum strain of 6.35 tons per square inch was allowed throughout for the steel work.

The Transportation of Railway Mail.

The order issued by the postmaster general requiring railroad companies to discontinue the practice of forwarding railroad mail without postage, is as follows:

It has been made to appear, on evidence satisfactory to the postmaster general, that officers and employees of the railway companies throughout the United States are in the habit of sending and carrying over their various lines letters outside the mails and not inclosed in government stamped envelopes, and which do not pertain to the cargo being carried on the train; and the carrying of such letters outside the mails is in direct violation of sections 3,985 and 3,993 of the revised statutes of the United States, which read as follows:

"No stage coach, railway car, steamboat, or other vehicle or vessel which regularly performs trips at stated periods, or any post route, or from any city, town or place, to any other city, town or place, between which the mail is regularly carried, shall carry, otherwise than in the mail, any letter or packets, except such as relate to some part of the cargo of such steamboat or other vessel, or to some article carried at the same time by the same stage coach, railway car or other vehicle, except as provided in section 3,993.

"For every such offense the owner of the stage coach, railway car, steamboat, or other vehicle, or vessel shall be liable to a penalty of \$100, and the driver, conductor, master, or other person having charge thereof, and not at the same time owner of the whole or any part thereof, shall for every such offense be liable to a penalty of \$50.

"All letters enclosed in stamped envelopes, if the postage stamp is of a denomination sufficient to cover the postage that would be chargeable thereon if the same were sent by mail, may be sent, conveyed, and delivered otherwise than by mail, provided such envelope be duly directed and properly sealed, so that the letter cannot be taken therefrom without defacing the envelope, and the date of the letter or the transmission or receipt thereof shall be written or stamped upon the envelope. But the postmaster general may suspend the operation of this section upon any mail route where the public interest may require such suspension."

I therefore hereby notify all railroad officials and employees that these sections of the revised statutes will be rigidly enforced, and all parties detected in their violation, whether officers of the railway companies, conductors on trains, baggage masters, brakemen, or other employees, will be prosecuted for such violations.

All inspectors of the postoffice department are instructed to keep a careful watch and arrest any person caught carrying letters in violation of these statutes.

HYDRAULIC EXCAVATION—GREAT NORTHERN RAILWAY.

In a number of places along the line of the Great Northern Railway particularly on the section of road between Everett and Seattle the track runs along the foot of bluffs which formed the shore of the Puget Sound, and where in many places the foot of the bluffs had been disturbed in order to construct the track, a great deal of trouble has been experienced with the sliding of the material which is of such a character as to become thoroughly saturated with water during the rainy season, making movements of considerable portions of the bank a rather common occurrence. Several methods had been tried with varying success for the disposition of the material which came down, the most successful being the removal of the material by steam shovels and gangs of men numbering between one and two hundred. The removal of the earth, however, after it had covered the tracks did not obviate the difficulty and prevent delays to trains and this led the



HYDRAULIC EXCAVATION—GREAT NORTHERN RAILWAY.

officers in charge to seek a more effective method. Mr. William Craig, the roadmaster in charge of the coast lines, was the first to suggest the employment of the hydraulic process and for experimental demonstration of the adaptability of this method, a small boiler of 25 horse power was obtained together with a small pump which had formerly been used at a water station on the road, and which was fitted with 250 ft. of cotton covered fire hose. With this plant located on a scow on the Sound it was satisfactorily demonstrated that this class of material might be most economically handled by hydraulic methods and the present plant is the result of that experiment.

For convenience in transportation the new equipment was fitted upon a flat car, 40 ft. in length, accompanied by another carrying a water tank. The pump is one of the Dean Brothers' duplex pattern

length which may be seen in the illustrations. A 3 in. nozzle tip was used formerly but during the last eight months the size has been reduced to 2½ in. with better results. The plant is operated by a force consisting of a foreman, an engineer, a watchman and six laborers, at an expense of about \$400 per month. The laborers are required to keep the ditches open and to handle the pipe and stumps.

Since this plant has been in operation large quantities of material have been removed at the locations where trouble had been experienced with the satisfactory result that during the past winter trains were not detained by slides and the pay rolls were materially reduced, which are two important factors in operation. This plant has handled 1,000 cubic yards per day at a cost of between two and three cents per yard and the officer in charge states that he is convinced that in good material such as composes the top of the bluff shown in the illustration, which is light sandy soil, these quantities would be nearly doubled. The record was made in the bank which has about four feet of light sandy soil on top



HYDRAULIC EXCAVATION—GREAT NORTHERN RAILWAY.

with 18 in. steam and 14 in. water cylinders, the stroke being 20 in. The boiler is of the horizontal tubular type carrying 125 lbs. steam pressure, in front of which the pumps are mounted. A house is built over the car for the protection of the men. This car is located on the Sound side of the main track and is connected to the Sound by a 14 in. suction pipe. In the case shown in the illustration this pipe is 200 ft. in length. The discharge pipe is 12 in. in diameter and varies in length with the conditions of working. The nozzle is 12 ft. in length and has at its inner end a ball bearing joint, which admits of easy handling of the stream by one man who operates the nozzle by means of a lever 8 ft. in

length which may be seen in the illustrations. A 3 in. nozzle tip was used formerly but during the last eight months the size has been reduced to 2½ in. with better results. The plant is operated by a force consisting of a foreman, an engineer, a watchman and six laborers, at an expense of about \$400 per month. The laborers are required to keep the ditches open and to handle the pipe and stumps. Since this plant has been in operation large quantities of material have been removed at the locations where trouble had been experienced with the satisfactory result that during the past winter trains were not detained by slides and the pay rolls were materially reduced, which are two important factors in operation. This plant has handled 1,000 cubic yards per day at a cost of between two and three cents per yard and the officer in charge states that he is convinced that in good material such as composes the top of the bluff shown in the illustration, which is light sandy soil, these quantities would be nearly doubled. The record was made in the bank which has about four feet of light sandy soil on top

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CHICAGO, SATURDAY, JULY 18, 1896.

SPACE is given and attention directed to an abstract of an article published in the *Engineering Magazine* for July, which will be found on page 401 of this issue. The article should be read entire, but the abstract will give an idea of its character. Than Mr. Ingalls, perhaps no one in the United States is more competent to speak of the subject under consideration, and if as he claims, the turning point of railway reforms has been reached, there is cause for congratulation. It is, of course, not expected that the millennium in railway rates will be immediately realized, but if there is a well settled determination on the part of conservative railway men to demand whatever protection the law affords, a marked improvement in the present situation will soon be apparent.

IT SEEMS probable that iron and steel values will not soon again be subjected to fluctuations. If the ups and downs the industry has encountered during the past twenty years or more have resulted in a stability of values, the benefits will be lasting. Has this point of stability been reached? Within certain fractional limits it probably has. Consumers protest against coke prices, and competing ovens in other fields are rapidly being built. Ore quotations are somewhat above the views of consumers, and corrective agencies are now at work in this direction. If ore freights by land are too high a new railroad will help to lighten the inequality. If the billet pool charge too much for billets, the erection of open hearth furnaces will correct that. If steel rails are too high at twenty-eight dollars, anxious capitalists will not let consumers suffer too long. These shading down agencies are all working to reduce prices fractionally. Associative effort can check the decline to unremunerative levels as the beam manufacturers have done, but no combination of producers can maintain prices above fair quotations. There are those who incline to think steel rails are an exception, but if so, the agencies at work will correct steel rail prices in time, as well as all others. The rumors of new and immense steel works might yet become realities.

ATTENTION is called to the report of a committee to the Central Railway Club which appears upon another page of this issue, in which the annunciator system of ordering tools is advocated in connection with tool rooms in machine shops. The recommendation applies to shops employing over two hundred fifty men and it would be an economical plan to put into effect in shops much smaller than that provided there was sufficient demand for tools to keep a single messenger boy busy. The suggestion that the men should anticipate their wants and call for tools before they are required is a good one and much time of high priced men might be saved by employing errand boys who would take the tools directly to the work where they were wanted, instead of requiring the men to go after them. There is a tendency on the part of some men to use considerable time in the preparation of tools and in trips to the tool room for them, and in those shops where provision is made to save the time of machinists by having all

tools ground for them, a further saving may be effected by the introduction of the annunciators. The annunciator apparatus may be made in a simple and inexpensive manner. The presentation of these suggestions by a committee of a railway club is to be commended for the reason that it is believed that there are many tool rooms in which these ideas may be carried out with profit.

IT is currently reported that the Pennsylvania Company instead of equipping some of its present live stock cars with air brakes in accordance with the interstate commerce law, is disposing of them to other companies and building new and larger cars. Among these sales is one of a thousand cars to the Keystone Live Stock Company. As to the composition of this company, we are ignorant, but if as the name would suggest, this is a private car line, operating chiefly over the Pennsylvania road, a curious state of affairs is probable. Even admitting that private car lines were ever a legitimate factor in railroad operation, their day is now past. Their existence is a menace to the economical operation of any road that permits their use and the history of their operation is one which reflects no credit upon the management of the various roads employing them. In the case here referred to, it would seem as if the officials of the railroad company were of the opinion that these particular cars could not be made to pay if employed in regular railroad service, but that contingency was apparently not feared by the officers of the Keystone Live Stock Company, whose revenue from these same cars must be drawn from the railroads. It will of course be claimed that this is not the concern of the railroad companies and that if they can thus to dispose of old equipment they are justified in so doing. No fault can be found with this as an abstract proposition but if the transaction includes an arrangement for using these same cars so extensively and at such a paying rate as to make them a profitable investment for the purchasers, the question assumes a different aspect.

THE ORDER of the postmaster general concerning the transportation of railway mail by railroads outside of the government service, will be found in another column in this issue. It will be noticed that by the terms of the law therein quoted, the postmaster is justified in the position taken by him, but it is at least questionable if upon a trial of the case the law would be found constitutional. There is probably no doubt that the practice of transporting the railway mail of one company by another is a violation of the principle underlying the postal law, and had the railways confined their mail service strictly within the lines of their own business the present order would not have been issued. The case is by no means a new one. Several years ago a similar demand was made upon the Chicago, Burlington & Quincy Railroad Company. The matter was taken under advisement by Mr. James F. Joy and Mr. J. M. Walker, then with that company, and than whom no more competent lawyers could be named, and it was decided by them to refuse to accede to the demand; and the subject was dropped. When some years later the railway mail exchange was first inaugurated the matter was again discussed, and it was thought best at that time not to attempt any extension of the service beyond the city; but with the lapse of years, and because of its convenience, this service was extended until an average of about three hundred thousand pieces per month, some of them very bulky, pass through the Chicago railway mail exchange, the most of which are letters which pass over other roads than the one on which they originate. As already stated, there is probably no doubt that the government has a right to prevent one railroad from carrying the mail of another, but there is probably no more doubt that it cannot prevent the carrying of its own mail by any single road. It would scarcely be held that the Illinois Steel Company could be lawfully prevented from dispatching a letter by messenger from its office in the Rookery to its mill in South Chicago or Joliet, and similarly it is difficult to conceive upon what hypothesis the government can proceed against a railroad corporation for sending by its own messenger on its own conveyance, a letter from its office in Chicago to its office in

Burlington or any other point on its road. The trouble is that the privilege has been abused. The initials R. R. B. have been made to do much service for which they were not intended and which is plainly a transgression of government rights, and it is not strange that in view of the magnitude of the business that the government has issued its prohibition. It is no purpose of the RAILWAY REVIEW to advocate violation of law, but it would be well now that the matter has been again brought to the attention of the authorities, if a friendly case could be made up and the subject definitely settled.

ONCE more, and finally, referring to the question of long distance transportation by means of car floats, concerning which a somewhat extended discussion has taken place between the *Timberman* and this journal, it is to be said that our contemporary has unwittingly admitted the main reason for our contention as to the illegitimacy of the practice. Starting out with the proposition that because of the fact that a railroad is a public carrier, it is entitled only to a legitimate and reasonable instead of an extraordinary profit, it says, "And if a scheme has been devised by which cars can be transported hundreds of miles by water instead of by rail and go from consignor to consignee without breaking bulk much more cheaply than in any other way, why should not the public have the benefit of that reduction in rates and the all-rail lines be content with doing the business they can profitably do on a competitive basis?" The cost of transportation is made up of several factors which may be grouped together under two general heads, viz: fixed and movement expenses, the latter term embracing only those items involved in the actual movement of property. Now when it is understood, as is actually the case, that it costs less to roll a given quantity of freight over the rails of a railroad than it does to push the same quantity of freight through the water, even under the most favorable circumstances, it will be seen that on a question of competition, the car float is at a disadvantage. The whole point of the case is that cars cannot be "transported hundreds of miles by water without breaking bulk much more cheaply than in any other way." The employment of the car float rests upon no such legitimate ground. Whatever may be the object of the parties interested in the particular scheme under discussion, it is perfectly safe to say, that had there not been already in existence a well established railroad traffic and to which the car float was a menace, the new route would never have been established. In the days when pooling was practiced, it was quite common for some roads to inaugurate a round-about route between pooled points in opposition to the direct line; not with the idea of carrying traffic in opposition to the direct line, but for the purpose of demanding a bonus to keep out of the trade. Such schemes were often successful, it being found by the direct lines cheaper to pay the bonus demanded than to engage in a rate war. It is just possible that the projectors of the scheme under consideration have not altogether forgotten the experiences of former days. Legitimate competition should be encouraged as being the best method of ascertaining and maintaining reasonable rates, but so long as the people are required to pay the sum total of transportation charges, so long will any competition based upon any other ground be expensive as well as harmful.

IN view of the importance to railways of doing away with every stop such as those required by law at grade crossings with other roads, as well as the safety which is provided by means of the introduction of signaling and interlocking apparatus at such crossings, it is strange that greater efforts are not made looking to the regulation of interlocking apparatus by statute. There are states wherein trains would not be permitted to pass grade crossings without stopping even if interlocking appliances were provided, and as this is discouraging to the adoption of these improvements it is gratifying to note that the state of Ohio has recently enacted a law permitting trains to be run at speed through interlocked regions providing the controlling apparatus has been installed in accordance with the provisions required by the commissioner of railroads and telegraphs. This law appears elsewhere in this

issue and an examination of it will show that in its essential features it resembles the interlocking statute of the state of Illinois. The Ohio law, however, is an improvement upon that which has been so successful in Illinois, in that direct provision is made for the protection of electric railways whether crossing electric railways or crossing steam lines, and the rules applying to steam lines crossing steam lines are practically the same in both cases. It is noteworthy that the Ohio law provides that when "any railroad" which crosses a stream by a swing or draw bridge, shall be interlocked with approved apparatus, the engines and trains of such railroad or railroads may pass over the bridge without stopping, which seems to be ample statutory provision for the protection of dangerous draw bridges from electric street car traffic. It has been frequently pointed out in these columns that draw bridges upon these lines constitute an element of serious danger unless proper interlocking devices are installed, and it is to be hoped that existing laws in other states which are not explicit upon the protection of these points, will be made so as soon as possible. Section 2 of the Ohio law provides for the settlement of questions arising in connection with the application of interlocking apparatus in cases where managers may desire to unite with those of other roads in the installation of these devices. Opportunity is here offered for the settlement of such disputes among the roads themselves with final recourse to the state commission for the settlement of the disputed points. A similar regulation in the rules for Illinois has worked admirably in practice, there being remarkably few cases which have been referred to the commission. Section 3 is important in that it requires any railroad or any electric railroad company which shall seek to cross another main track at grade, to interlock the crossing to the satisfaction of the commission and further that the new line shall bear all the expense of this apparatus both of installation and of maintenance. This amounts to saying that all future crossings at grade shall be provided with interlocking apparatus, which is a marked advance in the interest of safety. The act is made complete by naming a penalty of five hundred dollars for every violation of its provisions. The effect of the legislation will unquestionably be to make railroads more careful in regard to the crossing of other lines as well as to render such crossings, if made, as safe as possible.

THE ACCIDENTAL UNCOUPLING OF M. C. B. COUPLERS.

One of the most important of the live questions which were introduced at the recent convention of the Master Car Builders' Association was that which referred to the frequency of the accidental uncoupling of M. C. B. couplers while on the road. The discussion had the effect of convincing all present of the gravity of the situation with reference to the break-in-tuos of trains and it showed that the trouble was very general all over the country. All members who took part in the discussion had had numerous cases in their own experience. Mr. Waitt in his introductory remarks stated that the idea of suggesting this as a subject for topical discussion occurred to him while speaking to another member of the association and comparing notes in regard to break-in-tuos. After this conversation he had made up his mind to investigate and ascertain the number of cases which were occurring on the Lake Shore road. His fears proved to have a foundation from the fact that the record which was kept for six months, including the yard and road service, showed that there were four hundred sixty-seven cases in that time. This is an astonishing large number of accidents of this kind for one road, yet there is no reason for thinking that it would not be matched by a great many other roads and it is likely that with a less perfect grade line than that which exists on the Lake Shore, other roads might far exceed this record. Mr. Waitt stated that forty-five per cent of the breaks occurred between cars equipped with link and pin couplers and were caused by the coupling pin breaking or working out or by the link breaking. Twenty-six and one-half per cent of the rest of the cases occurred from the opening of the knuckles of M. C. B. couplers, twenty-one per cent occurred on account of the draw-bars pulling out which was caused by the

breakage of spindles or draw-bar keys or the dropping out of the keys. The rest of the cases were due to causes which are not classified but the three causes mentioned cover over ninety-two per cent of the cases.

As this record looks rather bad for the automatic coupler it seems fitting that an inquiry should be instituted into the causes of the opening of the knuckles, and steps should be taken to provide against such occurrences. Mr. Waitt calls it a "hard subject to tackle," and no one would be inclined to dispute this. He found a large amount of the trouble to be with defective uncoupling devices, and with sixteen or more of these devices of different designs upon the market it may fairly be expected that they would not all be equally good and free from troublesome defects. (Incidentally it may be remarked that this emphasizes the desirability of boiling down the number of these arrangements, which will probably be satisfactorily done before the next convention). So far the blame cannot be placed upon any special make of coupler, for, according to the Lake Shore records, they all seem to be under this cloud. In the discussion which followed Mr. Waitt's remarks several forms of couplers were specified by different members as having given this trouble, and in the absence of satisfactory figures it may perhaps be assumed that none of them are entirely exempt from it. At least, in view of the serious consequences of the parting of trains which are augmented up to a certain point by the increasing number of air brake cars, it would pay to find out the steps which are necessary for prevention. Suppose, for instance, that a train separates between two of the last air braked cars, which are presumably all at the head of the train, the first portion of the train would be brought to a quick stop by an emergency application, and if the shock given by the collision between the two parts of the train is sufficient to throw a single car off the track the piling up of many cars would probably ensue. This endangers not only the train to which the accident occurs but also others which may be running upon neighboring track, and the statement that this danger constitutes a seriously weak condition in handling trains is certainly a mild way of expressing it. It is, of course, understood that with the unusual application of air brakes under the law this extreme danger will be largely eliminated, but that only changes the degree of importance with which the question should be regarded.

Now in view of the present situation in which these troubles are known to occur and for which only partially satisfactory reasons are known, why is not this subject an appropriate one for the best and most complete series of tests which can be made. It would perhaps be extravagant to say that this subject is as important as were the brake trials at Burlington, yet it nearly approaches that work in importance to the roads. It was only a few weeks ago that one of the worst freight wrecks ever known on a large railway system was caused by the separation of a train presumably on account of a failure of two M. C. B. couplers to stay together. This constitutes a subject for individual investigation and the officers who will undertake the work will earn much approbation beside the direct benefits of knowing what to do to prevent these accidents. Who will undertake it?

THE TURNING POINT IN RAILWAY REFORMS *

BY M. E. INGALLS.

The year 1895 was probably the turning point in the management of railways in this country. They were only a little over half a century old,—in fact, one of the greatest has just celebrated its semi-centennial, and very few railway corporations were in existence fifty years ago,—but in this short time they have grown to immense proportions. No better illustration of this growth can be seen than in that of the corporation just alluded to,—the Pennsylvania Railroad, one of the greatest companies in the world. Statistics were not so well kept in early days as now, but in 1852 the Pennsylvania reported that it had carried 102,000,000 tons of freight one mile, at an average rate of 3.76 cents per ton per mile. For 1895 it reports 8,173,218,403 tons of freight one mile at the rate .56 cent per ton

*Abstract of an article in Engineering Magazine for July.

per mile. Nothing like it in the history and development of the human race has been known. The combination of the iron way with the propelling power of steam has advanced the world more in fifty years than all else that had been discovered in the fifty centuries preceding. It has furnished employment to an immense army of men, most of whom require a peculiar education and training for the business. A million of men (in round numbers) are engaged in this occupation; as many more in the furnishing of supplies and material necessary for the business; and over and beyond it all is the influence which this traffic has upon the life and civilization of the nation. So that a man or woman whose life and condition are not affected by railways must live in some place practically beyond the reach of civilization.

The history of the railways in this country shows the progressiveness of the Anglo-Saxon race better perhaps than anything else that history records. Greater than any conquest of a country, greater than any other advance in civilization, has been the progress of the railways in the last fifty years. Originally constructed to aid scattered communities, and, in most cases, to connect navigable waters, they have long since neglected any connection with rivers or canals, and have carried freights in quantities and at rates that even DeWitt Clinton, when he built the Erie canal, never dreamed of. Built at enormous expense, they were allowed at first to charge rates which now seem extravagant, and were given almost unlimited privileges. Fortunes were made by some of the early adventurers, but more were lost. After a little, barnacles grew up (as they always do upon every great business), outside profits were made, and various pretences were seized upon to organize parasites to fatten out of the business. There was also the contractor and promoter who built miles and miles of railway, taking the bonds, subsidies, stock, issuing as much as he could sell, selling it at almost any price, and in many cases pocketing fabulous profits, and leaving the poor owners of the railway, and the communities which it served at loggerheads and angry with each other. The communities, looking at the large profits made by these contractors and harassed by business depression, turned upon the railways, and, by means of legislation, endeavored to regulate rates and secure reductions. The first and most notable attack was the Granger legislation, which was strengthened and made more acute by the panic of 1873. The railroad officials themselves, encouraged and spoiled by the great power they had, in many cases were insolent and lawless, and this added to the trouble. The fight as to whether railways were public corporations and could be controlled by legislation lasted for many years, and finally culminated in the decisions of the supreme court that there were certain limitations which legislation could apply, and, ultimately, the enactment of the interstate commerce law, which endeavored to regulate all the railways in the country that were doing interstate commerce; and there were practically none that were not. This law was passed in 1887, and I think we may conclude that from that time the question was settled that railways were public corporations, subject to legislative control. After its passage, it was accepted by the great body of railway managers, and for some little time one year at least, and perhaps two or three—it was obeyed, and rates were fairly well maintained. Soon, however companies in search of business began to resort to their old tricks of securing it, and by various subterfuges evaded the law; and, after the decisions in the Counselman and other cases, these practices became more bold, and even many of the lines which desired to obey the law were forced to meet the practices of their competitors or loose their business and see their companies go into bankruptcy.

Probably a worse state of affairs never existed in reference to a large business interest than that which prevailed among the railways in the early part of 1895. In June 1895, there was held in New York a meeting of representatives of the lines between the Mississippi river and the Atlantic ocean and north of the Ohio and Potomac. I have never before seen a body of men, managing great enterprises so discouraged over the situation, and so hopeless of any future. Rates on grain from the Mississippi river to the ocean were being made at ten cents per hundredweight; west-bound rates from the seaboard cities at almost any figure that the shipper cared to ask for. A large number of lines were in bankruptcy, and many more which have since gone there were trembling on the brink. Because of the most utter want of faith in the promises and assertions of many railway officials and agents, their word or agreement was accepted

if at all, among each other, with the greatest distrust and suspicion, and the public generally was not slow in learning the true situation. There was then in progress an education in this suicidal method of railway business. A few of the managers present thought it worth while to attempt a reform, and after some effort succeeded in inducing all to join. It was then agreed by the presidents of the large railways in the territory I have alluded to that tariff should be maintained on and after July 12, and a committee was appointed to devise some new plan for maintaining tariffs in the future. All through the summer and fall many of the chief railway officials worked at this business, and out of it grew what is known as the Joint Traffic Association. Just as this was starting, there came the decision of the supreme court in what is known as the "Brown" case, which practically decided that parties under prosecution for giving secret rebates can be compelled to produce books and tell what they know, if they are not on trial themselves; this aided in what we were doing, and the result has been that from January 1 tariffs have been maintained practically all over the country. Other associations in other districts followed in the lead of this strong one, and in the twenty-five years that I have been managing a railroad I have never known such an adherence to tariff as we have had for four months. The burden is upon all to see that this improvement is made permanent, and unless it is the profession will be disgraced, and conscientious men will want to leave it and seek some other employment. If the railway business of this country is to be conducted in the future as it was to an alarming extent for we will say the two years ending June 30, 1895, those of us engaged in this profession would lose the respect of ourselves and of our fellow-citizens and deservedly so. These I know are strong words and harsh ones, but they are true. If, on the other hand, the business can be conducted with strict regard to law; if tariffs can be maintained and agreements enforced—it is a business that will demand the brightest and best minds of the country.

The railway officials of this country must be educated to respect their tariffs, and unless they do respect them there is no future for railways. Tariffs should be made by the directors, and when once made and published they should not be changed except by the same authority. Freight and passenger men should be taught that they are employed to secure business at tariff, and not by reducing it; that they can present the advantages of their lines as to safety, convenience and dispatch, but that the published tariffs cannot be varied from. When this is once established, railway operations will be profitable and railway management will be respectable. The railway carries in its hand great promise to our country for the future. Let each official strive to make to the profession an honorable one: to conduct his business so that the community will respect and honor him; above all, let him heed the admonition, "to thine own self be true."

A most admirable feature of the new era is the formation of railway clubs. There is nothing like union and association to improve and advance men. The social features are of great advantage, but more than all and above all is the good that comes from conference. Rough edges are rubbed off, sharp competition is forgotten, and the good which can be accomplished by union is learned and remembered. The last twenty-five years have brought about a wonderful advance in friendly feeling in the operation of rival railways. Just a little over a quarter of a century ago, when an important bridge on a certain western road was burned, the president of the competing line hoisted the flag over his own company's terminal station in celebration of the event. To-day, should a bridge go down on either of these roads, the train-despatchers would at once arrange to move the trains of the unfortunate railway over the other line, without friction or delay and without reference to the presidents or general managers—very possibly before the higher officials had even heard of the calamity.

Great benefit to all results from association. Each railroad official may still strive for himself and his own line first, but never in forgetfulness of his duties to others and to the general public.

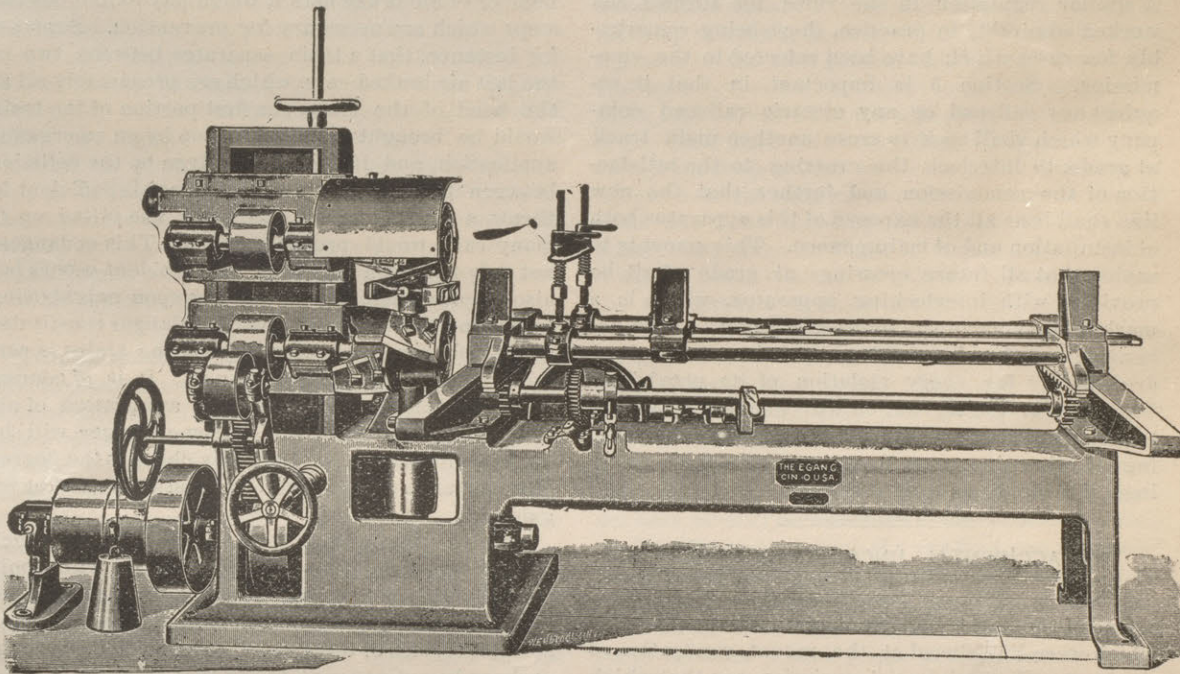
Roadmasters' Association.

The annual convention of the Roadmasters' Association will be held on Tuesday, Wednesday and Thursday, September 8, 9 and 10, at Niagara Falls, N. Y. Arrangements have been made with the management of the Cataract House for the accommodation of the members of the Roadmasters' and Road and Track Supply Associations, at the rate of \$3 a day, ample space for the exhibition of supplies being given without extra charge. It is the desire of the officers of this association to make this the best convention in its history, both in the number of supply men in attendance and the number and character

of the exhibits made, and they ask for the fullest co-operation and the attendance of supply representatives with their devices. If those desiring space will advise Mr. Harry C. Frost, 1453 Monadnock block, Chicago, of the amount desired for their exhibits, together with the character of the goods, space will be assigned.

A HEAVY CAR TENONING MACHINE.

In the No. 5½ heavy car tenoner the Egan Company of Cincinnati, O., has brought out a design specially arranged for cutting single or double tenons on large timbers, and with particular reference to the requirements of car and bridge builders and others who are called upon to use tenons on large timbers. It is also adapted to do general work of this character. The machine is fitted with single or double heads and has an upright spindle for double tenons. As shown in the accompanying illustration, the main column is extra heavy, and is cast hollow, of latest design. The extension supporting the bed is bolted to the column in a superior manner, with planed surfaces, and the machine has ample floor space to insure steady running. It is heavy enough throughout to stand any vibration or heavy work to which it may be put. The table is of ample proportions and is made to move back and forth on planed ways. It is given its movement by a rack and pinion at each end, receiving motion through the long shaft in such a manner as to cause the table to move in parallel lines, both pinions being located on the same shaft and the parallel movement of the table relieves the ways on which it moves of any undue friction, which is a great improvement over those operated by power



A HEAVY CAR TENORER.

applied at only one end of the table. The frictions that drive this table are of large diameter, and the table returns to the operator at about twice the speed that it goes forward, enabling the machine to increase its output. The movement of the table is controlled by means of a lever convenient to the operator, and the pressure applied governs the travel of the table, according to the width of the tenon to be cut, moving the table either a long or a short distance, as required. The center support is adjustable for long or short stock, and gage rods are furnished to regulate the length of the tenon and suitable devices are furnished to hold the stock in position while being cut.

The mandrels are of large diameter, made of the best quality of steel and are provided with self-oiling boxes. The pulleys on the mandrels run between boxes, and the strain being equal on both journal boxes allows the mandrels to run perfectly. A belt tightener is provided for taking up slack and providing proper tension to give the cutter heads sufficient power when taking a heavy cut. Tenons as long as 12 inches can be cut at a single operation when the machine is fitted with double heads, or it may be furnished with single heads to cut a tenon as long as 6 in. Double tenons 4 in. in length can be cut when the machine is furnished with the upright spindle, and it is made to take in timbers up to 14 in. square. Suitable locking devices are furnished to keep the slides which carry the mandrels from working out of line, and a separate slide with an extra plate is furnished to regulate the upper mandrel to suit the lower. The upright mandrel for cutting double tenons runs in self-oiling boxes of ample size and length, and is constructed so that the upright head can be taken off

quickly when it is desired to cut single tenons. The machine is furnished with or without the upright mandrel. The tight and loose pulleys are 12x6½ in. face, and should make 900 revolutions per minute. Further information may be had upon application to the builders at 249 West Front street, Cincinnati, O.

Extension of Electric Traction—N. Y., N. H. & H. Railroad.

An illustrated description was given of the electrical equipment of the Nantasket Beach branch of the New York, New Haven & Hartford Railroad between Nantasket Junction and Pemberton, in the RAILWAY REVIEW of August 3, 1895. An extension has just been completed whereby the connection between Nantasket Junction and East Weymouth, 3½ miles along the South Shore branch of the Plymouth division of that road will be operated by electricity instead of by steam. The feature of special interest in this extension is the employment of a third rail for the conduction of the motor currents instead of the trolley which is now in use upon the rest of this branch. A trial trip of the third rail system was successfully made June 26, and was witnessed by a large number of prominent railway officers of the New Haven and other systems as well as electricians who have been prominent in the application of motors to railways. The trip was made from Pemberton to Nantasket Junction by the use of the trolley and at this point the trolley connection was broken and the current was taken from the third rail for the rest of the trip. A speed of 70 miles per hour is reported to have been obtained upon

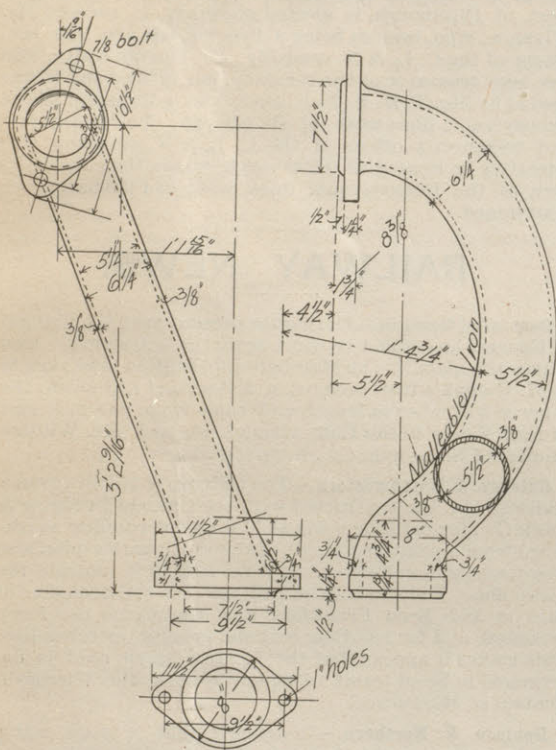
this latter section but no information is available as to how the data were secured. The third rail system has been employed upon elevated roads but never before has it been used in permanent construction along the line of the surface roads which have been operated by steam. The current supplying this section of line is obtained from the same supply as that for the trolley line referred to and is brought to Nantasket Junction by means of two insulated copper cables supported by a pole line. These feeders are attached to the third rails at the junction station.

The conducting rail is of a section which resembles an inverted V with the top portion flattened for a bearing for the shoes which are similar to those in use upon the Metropolitan and Lake Street elevated railways in Chicago already described and illustrated in this paper. The third rail is located midway between the traffic rails and is supported by ash blocks placed at 10 ft. centers. The blocks are let into the ties and are prepared by boiling in vacuum pans containing a tar compound which fills the pores of the wood with an insulating and preserving liquid. The third rail is in 30 ft. lengths and weighs 93 lbs. per yard. The insulation is said to be entirely satisfactory. Two heavy copper bonds are employed at each joint to secure the electrical connection between the rails. The collectors or contact shoes are separated for each truck and the return is made by means of the traffic rails through contact between them and the wheels. The shoes are separated by a distance of 30 ft. on each car and at crossings and switches the third rail is omitted, the distance between shoes being sufficient to span a gap of more than 30 ft. and for wider openings the momentum of the cars is relied upon for taking the shoes into

contact with the rail upon the further side. Sixteen open cars with 16 settees each have been equipped with two G. E. 2000 motors, two series parallel controllers, the necessary safety cut-outs, and brake apparatus in place of the baggage cars which were used last year. These cars will be used in regular service for the season and it is stated to be the intention of the company to extend the third rail to Braintree on the main line of the New York, New Haven & Hartford Railroad in the near future.

MALLEABLE IRON STEAM PIPES.

The practice of a large number of roads in regard to steam pipes for connecting the dry pipes to the cylinders of locomotives, was outlined in the report presented by a committee at the Saratoga convention of the Master Mechanics' Association, last month. Reference was made to the use of copper as material for this purpose in the days of wood burning locomotives which, while giving good results at the low pressures and with the wood fuel, were found to be troublesome from cutting by cinders when coal came into use and higher terminal pressures were employed. Cast iron has in consequence of this become the most generally used material for steam pipes and, in fact, has been employed except in very few instances. One trouble experienced with cast iron pipes is that, due to their thickness, they are necessarily stiff, and in spite of the fact that they are made in curved form, they are not able to relieve the joints of stresses and movements due to the changing length of the pipes in expanding and



MALLEABLE IRON STEAM PIPES.

contracting. It is customary to find cast iron pipes from $\frac{3}{8}$ to $\frac{7}{8}$ in. in thickness, which readily explains their stiffness.

With a view of providing for taking up the expansion and contraction of the pipes, the committee suggested as worthy of trial, that cast steel or malleable iron should be used, remarking that such pipes might be made quite thin and still have ample strength with the resulting advantage of springing instead of working at the joints when expansion strains are brought upon them. It was brought out in the discussion that experiments had been made in this direction by Mr. J. H. McConnell, superintendent of machinery of the Union Pacific Railway. He had first tried a set of pipes made of wrought iron which he found to be entirely satisfactory in operation, the only objection to them being the expense of construction and the inconvenience of having to screw on the flanges. His next thought was to try cast steel and correspondence was opened with the manufacturers with this in view, his requirements being that the material should be made up into pipes $\frac{7}{16}$ of an inch in thickness and capable of withstanding a pressure of 300 lbs. per square inch. He was not successful in obtaining satisfaction in this direction, and next looked up the adaptability of malleable iron. The National Malleable Castings Company took up the subject and made a set of pipes which they guaranteed and which have been applied with entirely satisfactory results, the expansion being entirely confined to the curving of the pipes, which is increased or decreased according to the temperature. As a result of this experiment Mr. McConnell

expects to equip all of his locomotives with steam pipes of this material, in accordance with the design shown in the accompanying illustration, which, however, may be modified for different types of engines, the form shown being used on eight wheel engines. He has found no leaks with these pipes under a pressure of 180 lbs. per square inch, and obtains the additional advantage of a difference in weight of between 273 lbs. for the gray iron pipes and 180 lbs. for the malleable iron. The thickness of the malleable iron pipes is less than that which was specified for cast steel and yet no difficulty has been found in securing satisfactory castings of this material.

Nickel steel is receiving considerable attention on the continent. An interesting paper on the subject was read at a recent meeting of the Verein Deutscher Maschinen Ingenieure by Herr Regierungsrath Schrey, in the course of which the author ventured the opinion that nickel steel would play an important part in the construction of material subject to the corrosive action of sea water, and considered that there was room for much further experiment in this direction.

NOTICES OF PUBLICATIONS.

The American Hoist & Derrick Co. of St. Paul, Minn., has published an illustrated pamphlet, standard size, 9x12 inches, showing different forms of yard and platform loading derricks operated by steam, air, horse, hand, electric or belt power. A large and fully illustrated catalog of such hoisting machines especially adapted to the requirements of railroad companies and shippers of heavy articles will be sent upon application. The company has offices at Chicago, New York and Cincinnati, as well as at St. Paul.

INSTRUCTION BOOK—OF THE QUICK-ACTION AUTOMATIC BRAKE.—The New York Air Brake Co., 66 Broadway, New York. 5x6½ in., illustrated, pocket book form, 1896.

This instruction book contains practical information about the operation, maintenance and care of the New York air brake and train signaling apparatus, and is conveniently arranged for the use of engineers, trainmen and others whose duties require a knowledge of this equipment. Beside the illustrations accompanying the descriptions, five plates are placed in a pocket at the back of the book, presenting large and clear engravings of the different parts of the equipment, showing their relative positions and arranged with a view of assisting in the study of the apparatus and the relative functions and influences of all the different parts. The explanations are upon the lines usually followed in instruction books of this character and include direction for attaching the apparatus to different forms of rolling stock. Rules for calculating brake power are given, and a comparison of the efficiencies of different pumps. The instruction book will be furnished to persons who are interested in the subject and who apply for it.

PRESS-WORKING OF METALS.—A treatise upon the principles and practice of shaping metals in dies by the action of presses, together with a description of the construction of such implements in their various forms, and of the materials worked in them. By Oberlin Smith, Mem. Am. Soc. M. E., Am. Soc. C. E., etc. Illustrated with 433 engravings, 276 pages, 8vo. John Wiley & Sons, New York, 1896, price \$3.00.

This book contains the information and suggestions which the author is able to offer from the many years of experience in connection with the manufacture of metals in presses with a special view of presenting such information as would be required by a designer who is called upon to get up a machine for performing some special work in the nature of cutting, pressing or stamping, drawing, curling or seaming of metal, usually in the sheet form. The fact that many of the principles involved in this particular class of work are not described elsewhere, gives it a special value aside from the fact that the subject is well and exhaustively handled and that many suggestions are given which would appear to be calculated to save the time of an experimenter who might otherwise have to work them out for himself. The development of the last few years in the manufacture of metallic articles has given an unprecedented impetus to the machinery employed in forming metals, many new designs of which are constantly coming into use. The style of the book is such as to be acceptable to readers who are not accustomed to technical literature, and it is not less desirable to those who are familiar with such subjects. A portion of the matter appeared about two years ago in the *Metal Worker* published in New York and also in the *Iron Age*. The subject has been expanded and elaborate as well as more fully illustrated in its preparation for book form. The text is divided into 13 chapters, the first three of which treat of the fundamental principles, definitions, classification and anatomy, and the history of presses the latter being presented in the form of a museum. The practical character of the work is seen in a portion of the second chapter in which is given a few of the most important points to be considered by a purchaser of a press. The succeeding chapters treat of dies, materials, the various processes, press feeding and miscellaneous matters. The processes are as follows, each having a chapter by itself: cutting, bending, curling and seaming, drawing

re-drawing, and coining, information of a practical character being given under each head, such as the important matter of the dimensions of blanks and the speeds which are permissible. In all of this work the author speaks as one with authority. The letter press is good and the illustrations with few exceptions clear, and while they serve the purpose admirably, a few of them showing drawn work attract attention as not being equal in quality to the majority in the book. Mr. Smith has done a valuable work, in the interests of those who have to do with the designing or construction of pressing machinery and those who are concerned in the operation of the machinery or the manufacture of dies therefor, will also find much that is valuable for them.

STEEL. A Manual for Steel Users. By William Metcalf.
New York, John Wiley & Sons, 12 mo. cloth, pp. 169;
\$2.00.

This little book is the work of a manufacturer of steel in one of the largest concerns in the United States and one qualified to speak with authority upon the subject by an experience of nearly thirty years. The purpose of the book is best stated by the following quotation from the introductory chapter:

"The literature of steel has grown with the art; its books are no longer to be counted on the fingers, they are to be weighed in tons. Then why write another? Because there seems to be one little gap. Metallurgists and scientists have worked and are still working; they have given to the world much information for which the world should be thankful. Engineers have experimented and tested as they never did before, and thousands of tables and results are recorded, providing coming engineers with a mine of invaluable wealth. Steel-workers and temperers have written much that is of great practical value. Still the questions come and they are almost always those involving an intimate acquaintance with the properties of steel, which is only to be gained by contact with both manufacturers and users. In this little manual the effort is made to fill this gap and to give to all steel users a systematic condensed statement of facts that could not be obtained otherwise, except by traveling through miles of literature, and possibly not then. There are no tables, and no exact data; such would be merely a re-compilation of work already done by abler minds. It is a record of experiences, and so it may seem to be dogmatic; the author believes its statements to be true—they are true as far as his knowledge goes; others can verify them by trial."

The contents includes the general description of steel and methods of manufacture, the applications and uses of the different kinds of steel, alloy steels and their uses; carbon, its uses and effects, the general properties of steel, and the handling with respect to heating, annealing, hardening and grinding. The latter portion of the work has to do with impurities and their effects, the theories of hardening, inspection, specifications and what are termed "humbugs." In the chapter which appears under the latter heading a warning is contained against nostrums which are offered for the conversion of ordinary Bessemer or open hearth steel into the finest of tool steel, also, those for restoring burnt steel and others, of similar pretention. Under "conclusions" hints are given as to what to avoid in order that steel users may be sure that they have the best material for their purposes. The book closes with a glossary of terms used in connection with steel manufacture. The work is a valuable one and especially so with reference to its treatment of the subject of crucible steel. There is much information contained in it which has never appeared before, and it should be procured by all who have reason to study the subject of steel or to use this material. It gives evidence of the high degree of familiarity of the author with his subject and makes it possible for those who may or may not be well informed upon the processes to obtain valuable insight into the manipulations which result in producing good steel.

TECHNICAL MEETINGS.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p.m., at the House of the Society, 127 East Twenty-third street New York City.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each month, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Tuesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Thursday in each month, at 8 p. m., at 12 West thirty-first street, New York City.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Engineering Association of the South meets on the second Thursday of each month at 8 p. m., at the Cumberland Publishing House, Nashville, Tenn.

Annual meeting Traveling Engineers' Association, Minneapolis, Minn., Sep. 8, 1896. W. O. Thompson, secretary 415 Marion street, Elkhart, Ind.

Annual Convention Roadmasters' Association and Road and Track Supply Association. Cataract Hotel, Niagara Falls, N. Y. second Tuesday in September, 1896.

The Railway Signaling Club holds its meetings in Chicago, Ill., on the second Tuesday of January, March, May, September and November. G. M. Basford, secretary, 818 The Rookery.

The Southwestern Society of Mining Engineers will hold a session at Albuquerque, N. M., September 16-19. Walter C. H. Adley, secretary, Albuquerque, N. M.

The International Irrigation Congress will hold its fourth session at Albuquerque, N. M., September 16-19. Fred L. Alles, secretary, Los Angeles, Cal.; local secretary, W. C. Hadley, E. M., Albuquerque, N. M.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Western Foundrymen's Association holds its meetings on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, S. T. Johnstone, 1522 Monadnock building.

The Technical Society of the Pacific Coast has a monthly meeting on the first Friday in each month at 8 p. m., at the Academy of Sciences building, 819 Market street, San Francisco, Cal.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at the Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1122 Girard street, Philadelphia, Pa.

The Civil Engineers' Club of Cleveland meets on the second and fourth Tuesdays in each month, at 8 p. m., at the Case Library building, Cleveland, Ohio.

The Association of Engineers of Virginia, holds its informal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The American Society of Irrigation Engineers. Third annual meeting will be held at Albuquerque, N. M., September 16-19. John L. Titcomb, secretary, 36 Jacobson block, Denver, Col.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Central Railway Club meets on the fourth Wednesday of January, March, April, September and October, at 10 a. m., at the Hotel Iroquois, Buffalo, N. Y.

The Denver Society of Civil Engineers meets on the second and fourth Tuesdays in each month except July, August and December, when they are held on the second Tuesday only, at 36 Jacobson building, Denver, Colo.

The Western Society of Engineers holds its regular meetings for the transaction of business and the reading and discussion of papers on the first Wednesday of each month except January.

PERSONAL.

Mr. C. R. Manter has been appointed traveling freight agent of the Peoria & St. Louis, vice Mr. S. E. Christie, resigned.

Mr. William J. Dale, Jr., has been reappointed a State Railroad Commissioner of Massachusetts for three years from July 1.

Mr. Harry Rusling has been appointed superintendent of the West Superior Rapid Transit Company at West Superior, Wis.

Mr. William J. O'Brien has been appointed freight solicitor of the Lake Michigan & Lake Superior Transportation Co. at Chicago.

Mr. Jos. H. Greene, late superintendent of the Southern Railway shops, Columbia, S. C., has been appointed superintendent of motive power for the South Carolina & Georgia Company.

Mr. F. K. Huger has been appointed superintendent of the Knoxville, Cumberland Gap & Louisville Company, vice Mr. F. Wynne.

Mr. G. J. Lockie, trainmaster and roadmaster of the Guadalajara branch of the Mexican Central, has resigned on account of ill health.

Mr. J. W. Jacob has been appointed agent of the Continental line at St. Louis, vice Mr. E. O. Pickering, general agent, resigned.

Mr. Peter D. McCarthy, formerly a ticket agent of the Santa Fe, has been appointed traveling passenger agent of the Great Northern road.

Mr. I. K. Dye has been appointed traveling freight agent of the Ohio River by Mr. John J. Archer, assistant general freight and passenger agent.

Mr. Thos. Beard has been appointed general agent for the freight department of the Erie lines in Chicago lines, with office in the Counselman building.

Mr. C. F. Osborne, formerly with the Erie Dispatch, has been appointed general agent of the Erie Railway for the northwest, with headquarters at Duluth.

Mr. C. H. Speers, formerly general passenger agent of the Atlantic & Pacific at San Francisco, has been elected president of the Kansas City Passenger Association.

Mr. F. S. Rawlins, superintendent of telegraph of the Cotton Belt, has been appointed superintendent of the line north of Pine Bluff, Ark., vice Mr. O. McGowan, deceased.

Mr. S. L. Finley, secretary of the Memphis Passenger Association, has tendered his resignation, having been appointed commissioner of the Walker City Coal Company of Alabama.

Mr. Robert Kepple, who has been traveling passenger agent of the Nickel-plate for the last five years, has resigned to accept a more lucrative position with an eastern business house.

Mr. Frank H. Hamilton, who was recently elected secretary and treasurer of the St. Louis & San Francisco, will take charge this week, and has decided to make St. Louis his headquarters.

Mr. R. S. Saupe has been appointed passenger agent of the Toledo, St. Louis & Kansas City (Clover Leaf) Line in St. Louis, and to also look after the Clover Leaf's interests at Union Station.

Mr. W. H. Quigg has been appointed division freight agent of the St. Louis & Southwestern, with headquarters at the Board of Trade Building, Little Rock, Ark., vice A. R. Peyinghaus, resigned.

The position of local manager of the Grand Trunk road at Toronto so long filled by Mr. Edmund E. Wragge has been given to Mr. E. H. Fitzhugh of Montreal, who begun his duties last Wednesday.

Mr. Edward Kamp has been appointed general superintendent of the Maricopa & Phoenix and Salt River Valley roads in Arizona. He was formerly connected with the Southern Pacific at Fresno, Cal.

Mr. C. O. Hunter, general solicitor of the Toledo & Hocking Valley road, has been elected president of the Wellston & Jackson Belt, which has now come under the control of the T. & C. V. Railway.

Mr. G. A. Warlton has been appointed superintendent of telegraph of the lines on the Southern Railway, and Mr. J. H. Sampson, superintendent of car service of the Knoxville, Cumberland Gap & Louisville.

Mr. F. C. Dunbeck, who for the past six years has held the position of general freight agent of the Chesapeake, Ohio & Southwestern Railroad, has tendered his resignation to become effective on the first of the month.

Mr. M. Nicholson, who was formerly city engineer of Knoxville, Tenn., has been appointed assistant engineer in charge of the Chattanooga Union Railway. He will be under Chief Engineer Hudson of the Southern Railway.

Mr. T. W. Geer, station agent for the Wabash, Chester & Western road at Mount Vernon, Ill., has resigned his place to accept the position of trainmaster of the Litchfield, Carrollton & Western Railway, with headquarters at Carlinville.

Mr. E. C. Minetree, formerly chief clerk to Edwin Fitzgerald, of the old East Tennessee, Virginia & Georgia Railway, has been appointed general agent of the Southern Railway, with headquarters in Jacksonville, in place of Mr. J. J. Griffin, resigned.

Effective July 21, Mr. W. P. Elder has been appointed traveling freight agent of the Central Ohio and Midland divisions of the Baltimore & Ohio Railroad. Mr. Elder will have his headquarters at the division offices in Columbus, and will report directly to Division Freight Agent Fairchild.

The following appointments were effective on the Mexican Central on July 1. Mr. W. H. Mealy having resigned, Mr. R. M. Thomas is appointed Terminal Superintendent at Tampico. Mr. F. J. Easley is appointed Superintendent of the San Luis Potosi Division to succeed Mr. Thomas.

Mr. William Berdan, secretary and treasurer of the Cooke Locomotive & Machine Co., of Paterson, N. J., and who has been associated with the business of that company for over 31 years, has resigned and will become secretary of the National Association of Locomotive Builders.

Mr. George Olds, formerly general traffic manager of the Canadian Pacific, and who for the last two years has been on the retired list owing to ill-health, has been appointed the representative of this road on the board of managers of the Joint Traffic Association, with headquarters at New York.

Receiver Oscar G. Murray recently announced that Mr. Perry W. Hanson had been appointed paymaster of the Trans-Ohio division of the Baltimore & Ohio, to succeed Mr. Edmund Jenkins, who died a short time ago. Mr. Hanson was Mr. Jenkins' assistant, and has been performing the duties of the office for several months.

As was rumored a few weeks ago, Mr. N. Monsarrat, president and general manager of the Columbus, Sandusky & Hocking road, has retired and been succeeded by Mr. W. E. Guerin, who has been vice president and general counsel of the company. It is reported that a number of changes will be made under the new management.

Mr. H. L. Harmon, general agent of the freight department of the Burlington road at Kansas City, Mo., has been given general charge of the passenger department in addition to his duties as representative of the freight department. He receives the title of general agent and succeeds Mr. H. C. Orr, who recently went to the Kansas City, Pittsburg & Gulf road.

Mr. E. P. Jenkins, paymaster of the Baltimore & Ohio, died at the Johns Hopkins Hospital, Baltimore, on Wednesday July 8.

When a young man Mr. Jenkins went to the Baltimore & Ohio as secretary to Vice President King; twenty years ago he was appointed paymaster of the road which position he held at the time of his death. He was highly esteemed by the officials of the road for his integrity and faithfulness.

The following changes are announced on the Chicago & Northwestern: Mr. C. H. Hartley, assistant superintendent, is promoted to superintendent of the Ashland division with headquarters at Kaukauna, Wis.; Mr. W. H. Sherman, trainmaster, is promoted to assistant superintendent of the Ashland division, while Mr. F. O. Tarbox, trainmaster, is promoted to assistant superintendent of the Ashland division, with headquarters at Ashland, Wis.

A number of changes have been made in the staff of the Erie Dispatch among which are the following: Mr. Frank T. McGan has been appointed traveling agent, with headquarters in Chicago. Mr. J. G. Dryden has been appointed agent in Kansas City, taking the place of Mr. E. J. Skidmore, who returns to Chicago to take his old place of contracting agent of the line. Mr. H. W. Forward has been retained in his present position as division freight agent.

The Pennsylvania system has appointed Mr. E. A. Dawson manager of the Star Union Line to succeed Mr. D. S. Gray, who for some time has been the Pennsylvania's representative on the board of managers of the Joint Traffic Association. Mr. Dawson has been the western superintendent of the Union Line, and will be succeeded in that position by the transfer of Mr. C. W. Forrester, general southern agent of the line from Louisville to Chicago. Mr. M. M. Hurley has been appointed general southern agent at Louisville. All appointments took effect Tuesday last.

The Cincinnati, Lebanon & Northern having now passed into the hands of the Pennsylvania, a number of changes in officials have taken place. Director John F. Winslow has resigned and Mr. J. T. Brooks is elected his successor. Mr. S. B. Liggett, secretary of the Pennsylvania lines west of Pittsburgh, is elected secretary to succeed Mr. Winslow, who, besides being a director, has also been secretary of the C. L. & N. company. Mr. George Hafer, who has been treasurer of the company, has retired and is succeeded by Mr. T. H. B. McKnight, who is treasurer of the Pennsylvania lines west of Pittsburgh. The secretary's and treasurer's offices of the C. L. & N. company will hereafter be located at Pittsburgh, where the general offices of the Pennsylvania lines west of Pittsburgh are maintained.

RAILWAY NEWS.

Central of Georgia.—During the present year the Central of Georgia has built two short branches in Georgia. One leaves the main line at Marshallville Station and runs to S. H. Rumph's fruit orchard, a distance of 3.21 miles; the other is 3.54 miles in length and runs from one mile east of Fort Valley to the Hale-Albaugh orchard. Mr. William Hunter of Savannah, Ga., is chief engineer.

Chicago & Northwestern.—The Chicago & Northwestern Railway Co., has contracted with the Chicago Dredging & Dock Co., for building a slip at Manitowoc running southward from a point just inside of the south harbor pier, also a protecting breakwater, 3,000 ft. long-60 ft. outside the shore line. The slip is to be utilized for the transfer of cars to and from Frankfort and Ludington car ferry steamers, and for handling coal and general merchandise. This makes it appear that the Northwestern road is determined to be on terms of equality with the Wisconsin Central at Manitowoc.

Denison & Northern.—It appears that a good many people have thought that this line notwithstanding the work already done would never be completed, but Mr. J. R. Hooper, who has charge of the townsites and land interests along the route of the road is quoted as saying that these fears are without foundation. The company now having charge of the construction has encountered a great many obstacles but they now have all the ties contracted for they will need, steel has been bought and shipped. Mr. Hooper says: "There are moneyed men who are standing behind the construction company and all the receiver's certificates are readily cashed by them. Within fifteen days men will be putting down steel. I haven't the slightest doubt that by next Christmas, Denison & Northern trains will be running into Denison. Engines have been bought and all preparation made for putting the road in operation as fast as possible."

Duluth & Manitoba.—On Friday July 3, Judge Jenkins made an order in chambers granting the petition of receivers Bigelow and McHenry of the Northern Pacific and authorizing them to execute a lease with the Duluth & Manitoba R. The receivers believe that the operation of this road in connection with the Northern Pacific and Manitoba line and the Crookston & Northern R. will be profitable. The road is 109 miles long and runs from Winnipeg Junction to Grand Forks. It was formerly leased by the Northern Pacific.

Duluth & Winnipeg.—After numerous postponements, it is said, the Duluth & Winnipeg road will be sold on Saturday, July 11. The several attempts which have been made to sell this property have been ineffectual because of certain obstacles, which it is now thought are removed. It is reported that the bondholders' committee will be on the spot with a claim of \$2,000,000. As it is not likely this claim will be met, the property will probably go to the committee which is considered about equivalent to saying that the Canadian Pacific will get it.

Flint & Pere Marquette.—It is expected that grading and bridging on the Toledo extension of the Flint & Pere Marquette R. will be completed by July 15 and that tracklay-

ing will begin by August 1. The company has placed orders for the rails for this extension, and expects trains will be running into Toledo in September. The Ann Arbor is pushing the work on the new station, which will be ready for use by that time. When this is completed the two roads will have adequate passenger terminals, as well as freight facilities.

Gulf & Ship Island.—A decision has been made by the secretary of the interior to the effect that the forfeiture of certain lands formerly awarded to the Gulf & Ship Island R. Co. of Mississippi was an illegal proceeding, and in consequence, the order has gone forth immediately restoring all land holdings which that corporation had theretofore possessed. By this decision nearly 200,000 acres of the best timber lands in the south, ranging in value from \$5 to \$20 an acre, have been restored to their rightful owners, and (which is of far greater import to American commercial interests) the early completion of a north and south trunk line railway, and the upbuilding of a big city, and the opening of the only natural harbor on the north coast of the gulf, are now practically assured. The story of the road is something as follows: It has now been about 15 years since Col. Jones S. Hamilton of Jackson, Miss., with a number of associates, among them certain well known capitalists of Chicago and New York, incorporated the Gulf & Ship Island R. Co. The scheme was regarded with great favor at the national capital, and from both the United States government and the state of Mississippi certain valuable land grants and other concessions were obtained almost for the asking. The object of the company was the opening of a large national harbor—almost as large as that of New York—at a point on the Mississippi gulf coast about 60 miles west of Mobile; the building of docks, warehouses and other adjuncts of a shipping and receiving port, and the founding of a city which the projectors fondly hoped would some day out rival Mobile and make New Orleans' commercial greatness an echo of history. Connecting this port with the railway system of America was to be a trunk line of something over 400 miles in length, running diagonally across the state of Mississippi to Memphis, Tenn., there to connect with the 12 rail lines entering Memphis from all points of the compass, and also to touch the Mississippi and Ohio river routes to the great markets of the north and northeast. All this was planned and well planned. Land had been bought up all along the surveyed line. 20 miles of track had been laid, some of the rolling stock purchased and the city of Gulfport laid off and already inhabited by a half thousand people. At this time evil days fell upon Col. Hamilton. He became involved in personal and political troubles which ended in a great tragedy in which he was very seriously injured and his opponent killed. After trial and imprisonment Col. Hamilton found himself bereft of all means and thus the building of the Gulf & Ship Island road was delayed more than ten years. Now, by the regranting of the forfeited lands to the company, Col. Hamilton and his associates have been enabled to take up the work anew, and construction of the railway was begun again only last week, and will be pushed to completion at the earliest possible day. It will run northward, and in Gulfport will be the only natural harbor along the American Gulf shore, excepting that of Pensacola, Fla. New Orleans is 110 miles from the gulf, while Mobile, its chief rival, is about 50 miles, and the expense of tonnage and lighterage at these two ports has been so great as to seriously impede commercial progress in that section. With the completion of the improvements contemplated under the charter of the present company, the people of the south expect great things to happen, among which will be the diversion of a great part of the Latin-American trade from New York and other Atlantic ports to Gulfport, as well as the further and immediate development of the southern fish, lumber and moss industries—not to mention the decreased cost of transporting cotton and other southern staples direct.

Lynchburg & Durham.—A decree of sale for the Lynchburg & Durham road has been signed by Judge Simonton of the United States court. This road which is 116 miles in length running from Lynchburg, Va., to Durham, N. C., is considered one of the most valuable pieces of railroad property for its size in the territory. It is under a 99 year lease to and for a number of years has been operated as a part of the Norfolk & Western system. The decree of sale is in favor of the Mercantile Trust Company of New York city, which recently obtained a similar decree for the sale of the Norfolk & Western property in Virginia.

Northern Pacific.—The Northern Pacific has made application to have the sale of the Seattle, Lake Shore & Eastern R., which took place on May 16 of this year, set aside, and the receivers of the Northern Pacific have been awarded judgment by default against the Seattle, Lake Shore & Eastern R. for \$1,258,690. The claim of the Northern Pacific was based on services rendered, money advanced and losses incurred in running the Lake Shore road, for which it was alleged the Lake Shore agreed to pay. The Lake Shore did not defend the suit, because it was admitted the claim of the Northern Pacific was bona fide, and because the Lake Shore property had been sold.

Patten & Sherman.—Work on the Patten & Sherman from Sherman station on the Bangor & Aroostook Railroad to Patten is progressing rapidly and the entire road will be graded by July 15. It is expected that the road will be completed ready for the running of trains by September 1. Mr. Parker C. Newbegin of Houlton, Me., is chief engineer.

Plant System.—A very interesting piece of work was done on the Florida Southern Railway last Saturday and Sunday in the way of broadening the gage between Brooksville and Palatka. A dispatch of July 9 from Gainesville

says: "More than 800 men passed through Gainesville to-day with tools, hand cars, etc., and will be distributed all along the line. All will strike at the same time, and all speed will be made. Nearly all of the spikes on the outside of each rail have been pulled, and all of the spikes for the outside of the rail for the broad gage have been partially set. All that is now necessary to convert the road to a broad gage is to pull a few spikes on the outside of each rail and spread them a few inches from each side. Eight standard gage engines have been brought to Gainesville, and are in readiness for the road. The cars used by the Florida Southern are all large and built for the standard gage, with the exception of the trucks, which are being changed in this city. On Saturday and Sunday no regular trains will be run on that road, with the exception of No. 23, which will go from Palatka to Brooksville some time in the afternoon, so as to do regular passenger service Monday morning."

This program was well carried out and the last spike was driven at 9:20 on Sunday evening, July 12. The main line of the Florida Southern is from Palatka to Brooksville, a distance of 145 miles, and in addition to this there are several important branches—Gainesville to Rochelle, 10 miles; Micanopy Junction to Tacoma, 9 miles; and Oak Town to Citra, 6 miles—making a total of 170 miles. Each roadmaster had under him 150 men, who worked under the immediate supervision of their respective stationmasters. Each roadmaster was assigned 23 miles of road, remaining with his men and conferring with and instructing them all during the day.

Queen Anne's.—Rapid progress is being made in the construction of this road, contractor Merritt having finished his grading contract to Hillsborough, Md. Rails have been laid from Queenstown, Md., to within two miles of Queen Anne's, and construction trains are running over this section of the road; work has also been finished from Greenwood to within seven miles of Denton. On the contract from Greenwood to Denton work has been finished to the state line, within seven miles of Denton. President Bosley and a party of capitalists from Baltimore recently took a ride over the finished portion of the road.

St. Joseph Valley.—According to report the work of construction of the St. Joseph Valley road does not seem to be progressing very smoothly. Trouble has been brewing between the St. Joseph Valley Railroad and Messrs. W. Redden and Augustus Willard over whose land the tracks of the company are laid. Messrs. Redden and Willard want payment for lands taken or company to vacate. After waiting some time they began tearing up tracks. The company replaced them about a week ago and promised to settle in a day or two. Failing to receive promised funds Messrs. Redden and Willard a second time commenced tearing up the tracks July 10 and leveling the road-bed and one engine is reported ditched by angry property owners along the route. There is said to be considerable excitement through that territory over the case.

St. Louis Siloam & Southern.—A mortgage has been filed by this company in Arkansas, the United States Mortgage & Trust Company being named as trustee. The amount of the mortgage is \$8,000,000 and it is understood that this mortgage covers the proposed issue of bonds of the same amount, which, it is reported, northern and foreign capitalists will take, thus insuring the building of the road through the states of Missouri and Arkansas to the city of Fort Smith, a distance of 1,300 miles. Mr. A. Merriwether is chief engineer and Mr. H. D. Mackey, of Pomona, Mo., is president.

San Francisco & San Joaquin Valley.—The total amount of this railway now constructed is 79 miles, from Stockton, Cal., to a point 14 miles south of Merced, Cal. Since January 1 of this year, track has been laid from the Stanislaus river south to Mariposa creek, a distance of 55 miles. The road is being extended from Mariposa creek south to Bakersfield, 170 miles, and it is hoped to reach Fresno by August 15. It is also proposed to build from Stockton to San Francisco, 100 miles. Twenty-five miles of track were laid in 1895 from Stockton south to Stanislaus river, making 80 miles of road now completed.

South Shore.—The South Shore company in Canada now operates 45 miles of line along the south shore of the St. Lawrence river from a point south of Montreal and an extension of considerable length along the south shore of the St. Lawrence river to connect with the Intercolonial road at Levis, opposite Quebec, is to be commenced shortly. An iron swing bridge has just been completed over the Richelieu river, having a 240 ft. swing, giving it an entrance to Sorel City, Que., the present eastern terminus. The line will parallel the St. Lawrence and will considerably shorten the distance between Montreal and Quebec. Mr. H. Beauchemin, of Sorel, Que., is general manager of the road, and Mr. E. C. Wurtele is treasurer.

Tennessee, Georgia & Atlantic.—Under the name of Tennessee, Georgia & Atlantic R. Co. a connection is to be formed between Augusta, Ga., and the west, by which Augusta will be 15 miles nearer Atlanta and 61 miles nearer Chattanooga, Tenn. Mr. Edward A. Richards, who has the project in hand, now controls the Northeastern Ry., extending 40 miles from Athens to Lulu, Ga. This will be a nucleus for the Tennessee, Georgia & Atlantic. The plan is to build 80 miles from Athens to Augusta, and 110 miles from Lulu to Chattanooga. The total length of the line will be 240 miles. The latter part of this month a preliminary survey of the line is to be made from Augusta to Chattanooga and the general offices and the plant of the company will be located at Chattanooga. The Georgia headquarters will be at Athens. The capital is to be \$5,000,000. Mr. Richards says that no one will be

asked to subscribe to the stock, but to the first mortgage 5 per cent bonds. Just so soon, he says, as enough is subscribed to give sufficient local interest along the line, work will be started. No money will be called for until the road is constructed and equipped. It will not cost over \$20,000 a mile.

Texas, Sabine Valley & Northwestern.—This road which was advertised to be sold on July 7, was duly offered for sale, but received no bids. Mr. Leon Hart, receiver for same, on the same day tendered his resignation. His successor will probably be appointed in a few days.

Washington & Idaho.—The Washington & Idaho Railroad from Tokoa to Wallace and Burke in the Coeur d'Alene, has been sold at foreclosure sale bringing \$11,615,740. The purchasers were Messrs. A. Marvins, Charles S. Fairchild, and Chas. S. Beamen, of New York, the purchasing committee of the Oregon Railway & Navigation Co.

Wheeling & Lake Erie.—Announcement has been made that the stockholders of the Wheeling & Lake Erie Co. had voted to increase its capital stock to \$5,000,000. Several reasons other than a general improvement of the property are given by President Blair. In issuing the \$5,000,000 stock the company is authorized to double track the road, increase its rolling stock and equipment. It is also said that one of the purposes was the development of the company's terminal facilities at Cleveland. Although the Wheeling & Lake Erie has had rights over the Valley road into Cleveland for some time, it has made no effort to use them, but with this increase of capital stock it will begin the development of its trade at Cleveland. The official statement issued by President Blair says: "That for the purpose of constructing a second additional track, extending its line, constructing branches thereof, increasing its machinery, rolling stock, depots and other fixtures, and for paying any bonds issued or guaranteed by it, and for the purchase of any railroad within the state of Ohio which has been or may hereafter be sold by a judicial order or decree, and for completing its line of road, and for any and all the purposes aforesaid, and for any of the purposes authorized by law, the capital stock of said company be increased from \$14,500,000 to \$19,500,000 by issuing additional common stock to the amount of \$5,000,000, divided into 50,000 shares of \$100 each; and that the stockholders of said company do hereby consent to such increase and decide that the same is necessary for the purposes aforesaid." The sentence referring to the construction might be construed to mean the construction of the proposed Wellington branch into Cleveland. It would give Toledo another Cleveland line only a few miles longer than the Lake Shore. The statement also says: "The company has recently received 12 new engines and 1,000 new 30 ton coal cars. New sidings are being built along the main line; 70 lb. steel rails have been laid in portions of the main track; new steel bridges are under contract to be placed in position by September 1. With the improvements now under way completed, the facilities for handling business will be 50 per cent greater than in the year 1895. The coal and iron ore contracts for 1896 show a considerable increase over 1895. The action of The Wheeling & Lake Erie is the result of the arrangement for using the Valley Railway of Ohio. The agreement for the use of the Valley railway for an entrance into Cleveland has finally been accepted and important improvements will be made in the terminals in the city of Cleveland for the Baltimore & Ohio and Wheeling & Lake Erie business. By this contract a joint line is established for Ohio, West Virginia and Pennsylvania coal to the lake front, which is the shortest existing line."

NEW ROADS AND PROJECTS.

Asia.—It is reported that a representative of the American Trading Co., in Japan, has obtained from the Korean government a concession for the first railroad in Korea between Seoul and Chemulpo. The distance by road is said to be twenty-six miles, but by rail it will be thirty.

Florida.—The contract has been granted to Mr. Jack Davis of Hilliard, Florida, to clear the right of way for the new road which is to be constructed between Crandall, Nassau county and the Florida Central & Peninsular and he has put a large force at work. Another gang is getting out cross-ties. Crandall is the headquarters and at night the place is enlivened by the many hands coming in from the woods to camp. A schooner will discharge 270 tons of railroad iron during this week.

The road which H. F. Dutton & Co., are building from Alachua to Trenton and beyond via Wade, is being pushed rapidly to the Suwannee river by a force of fifty men. The extreme west end of Alachua county, which has never known what railroad facilities were, will soon have three railroads, the Atlantic, Suwannee River & Gulf, Dutton's road, and the Fort White & Western. All of these roads will be complete to the river in a few months, and all of them will touch a point only a few miles in area.

Mexico.—The concession for the proposed Corralitos Railroad, after passing through a number of hands, has at last been transferred to an American syndicate formed of prominent New York capitalists and it is said that all arrangements for construction are now complete. Twenty shares at \$75,000 per share have already been subscribed, making a capital of \$1,500,000 in hand for the completion of the line. The road is projected from El Paso to Corralitos, a distance of about 159 miles, to Guerrero, about 300 miles and if the line is carried forward to the waters of the Pacific, the entire length will be about 750 miles. The road will pass over one of the finest stock, agricultural, mineral and timber lands on this continent. The timber is of great variety and extent, and of a quality such as could scarcely be conceived except by those who have seen it.

There are to be found in that section hundreds of thousands of pine trees, which it is no exaggeration to say measure from 3 to 4 ft. in diameter on the stump and reach 50 or 60 ft. in height without a knot or a limb. The water power on the tributaries in the Sierra Madre of the rivers Mayo, Yaqui and Arros, is abundant and will afford power for any number of manufacturing enterprises. There are already established on the proposed line of this railway several colonies, aggregating at present from six to seven thousand souls. It is expected a large influx of colonists will follow the building of this road and will probably amount to ten thousand in the next two years.

Missouri.—A company has been organized in Chicago for the purpose of building a line of railroad in Missouri from Versailles to Lebanon to be called the Missouri Central. This railroad, which will be 60 miles in length, will pass through several county seats and the great Ha Ha Tonka Park and Springs, and will open up the great mining section of the state, which is rich with coal, lead and zinc ore. Good farming and fruit lands are also located upon the proposed line. It is understood it will be operated in connection with the new line now building between Lebanon and Mansfield.

North Dakota.—The surveyors of the new line between Cavalier and Walhalla have finished their work, having reached the latter place on the evening of July 8. The road which is an extension to the Great Northern, will be about 18 miles in length and will be begun at once. It is hoped to have it finished in two months.

Texas.—A large and enthusiastic mass meeting was recently held at Jefferson, Texas, to perfect arrangements to have the Shreveport, Vicksburg & Pacific Railroad build into Jefferson from Waskom station. It is said that the right of way and cash bonus has about been secured, and the new road is assured.

West Virginia.—The Tygarts Valley R. Co. has been incorporated at Beverley, Va., to build a line from Beverley, on the West Virginia Central & Pittsburgh, to Mingo, in Randolph county. The incorporators are W. H. Dashur and E. D. Williams, of Moore, Tucker Co., W. Va.; J. M. Craig, of Beverly, and S. Marshall Williams and Percy L. Williams, of Everett, Pa. Capital stock, \$500,000.

Wisconsin.—It is stated that a survey is already completed of a new line to be built by the Weyerhaeuser logging syndicate and that excavations will begin in a few weeks. The proposed road will start at point on Allouez Bay, where the syndicate has acquired terminal property and run about thirty-five miles south by way of South Superior, penetrating the pine forests of the county, and connecting by means of branches with the numerous logging streams. It is claimed that the system will be the most extensive of the kind in the country, and that it will be utilized for traffic in connection with other railroads, as well as for logging purposes. A mammoth saw mill is to be built at the terminals.

INDUSTRIAL NOTES.

Cars and Locomotives.

—H. K. Porter & Co., Pittsburgh, Pa., are quite busy in car shops, and have a number of export orders for locomotives, two of which are to go to Johannesburg, South Africa; one to the island of Tahiti, and several to other points in South America.

—The Chicago, Lake Shore & Eastern Railway (formerly Calumet & Blue Island), has ordered 10 Page dump cars, to be built by the Madison Car Works.

—The Vandalia road has contracted with the Terre Haute Car Works for 50 refrigerator cars. They are to be built in accordance with the Pennsylvania road specifications.

—The Ohio Falls Car Co. has taken a contract from the Live Poultry Transportation Co. for the immediate construction of 10 live poultry cars.

Bridges.

—The construction of a steel bridge over Doan Parkway at St. Clair street, Cleveland, is proposed, although it is probable that it will not be built this year.

—President Roberts, Chief Engineer Brown and General Agent Latta, of the Pennsylvania Railroad, had a conference with Director of Public Works Thompson and Survey Chief Webster, of Philadelphia, recently, with a view to reaching an agreement as to the building of a new bridge at Gray's Ferry. The railroad officials were of the opinion that it would be much better to build two bridges, and that the city should hold its own. They also said the city wanted the railroad to pay too much as its share, and said the passenger railway companies that will use the bridge should also be made to contribute. After a talk of about two hours the railroad officials withdrew without reaching any agreement. President Roberts assured Director Thompson that he would state the proposition of the Pennsylvania Railroad Co. shortly.

—The city of Jackson, Ky., has voted to issue bonds for the purpose of erecting a bridge across the river between the town and depot.

—M. L. Scovell, general agent of the Kansas City, Pittsburg & Gulf Railroad Co. is reported as securing signatures to a petition to the war department for a bridge over the Sabine river at Orange, Tex. The structure as proposed will have a 60 ft. draw.

—The Grant county commissioners have decided to construct a truss iron bridge over the south branch at Bayard, W. Va.

—The council at Binghamton, N. Y., has voted to hold an election July 14 to vote on the question of constructing

a new bridge over the Chenango river at Ferry street, at a cost of about \$65,000.

—Work has been commenced on the pier of the Maine Central drawbridge over the Kenduskeag at Bangor, which was damaged by the ice and freshet last spring. The pier will be entirely rebuilt.

—Bids are asked by the county commissioners until July 30 for constructing the substructures and until July 31 for constructing the superstructures of three iron and steel bridges in Berks county, Pa., the bridges to be 50 and 70 ft. in length and 16 ft. wide. A river bridge having two spans of 110 ft. each at Berne is also projected.

—The new four-track drawbridge at Norwalk, Conn., the only four-track draw in the world, has been formally opened. It was built within the year at a cost of over \$261,000. This marks the completion of the four-tracking in Norwalk and vicinity, which cost over \$600,000, including the new terminal facilities for the Danbury & Norwalk Railroad. The four-tracking from New York to Haven is now completed with the exception of the improvements at Stamford and Bridgeport.

—A new iron bridge is to be built over the Kalamazoo river west of Pulaski.

—The petition of the Union Pacific receivers to expend the sum of \$85,000 in renewing bridges along the road having been granted, the contracts for the necessary material have just been awarded. The iron and steel work for the bridges will be furnished by the A. & P. Roberts Co. of Pencoed, Pa. The bridges that are to be built on the Oregon Short Line & Utah Northern road are as follows: One 147 ft. span bridge over Bear river, three 135 ft. spans over Payette river and two 135 ft. spans over the Weise river. On the Kansas division there will be two bridges, as follows: One 64 ft. span girder bridge over Muncey creek and one 125 ft. span girder bridge over Wild Cat creek. The masonry work for these new bridges will soon be begun, and the work of putting in the iron spans will probably be commenced during the latter part of next month.

Buildings.

—The Chesapeake & Ohio Railway Co. has been granted permission to erect a new passenger station in Richmond, Va., on Main street, to cost not less than \$150,000.

—The Lozier Tube Co., of Greenville, Pa., is to erect large tube works, in which it will install entirely new machinery.

—The Buffalo, Rochester & Pittsburgh is to erect car shops at DuBois, Pa., comprising a mill building 60 x 200 ft., engine house, 60 x 125 ft., blacksmith and machine house, 40 x 50 ft., storehouse, 48 x 80 ft., and a paint house, 24 x 96 ft., W. E. Hoyt, chief engineer of the company at Rochester, has the work in charge and will shortly give out the contract. The buildings will be of brick and iron.

—Messrs. E. A. Wheeler, of Sharon, and J. G. Michel-tree, of West Middlesex, will soon begin the erection of their new plant at West Middlesex, Pa., for the manufacture of corrugated steel roofing.

—The Florida Central & Peninsular Railroad denies the report mentioned last week that it will build a depot at Tallahassee, but enlarging and improving the present building is contemplated.

—The San Francisco "Examiner" states that Percy & Hamilton, architects, have commenced the erection of a new boiler shop for the Union Iron Works in that city. The building will be 60 x 200 x 65 ft., with electric traveling cranes, capable of lifting and transporting 60 tons. The entire building will be constructed of steel, with extra heavy columns, capable of supporting swinging cranes. The steel frame will be inclosed with brick walls.

—The report that the Atlantic Coast Line is to remove its general offices from Wilmington, N. C., to Florence, S. C., is officially denied. On the contrary, the company will expend \$20,000 at Wilmington in enlarging its general offices.

Iron and Steel.

—Now that the great plant of the Pennsylvania Steel Co. is not encumbered with the restrictions accompanying receivership management, it is proposed to make noted improvement in several departments, prominent among which will be the erection of a latest improved blooming mill to supplant No. 1, which generally furnishes the material for the rail mill.

—The South Pittsburgh (Tenn.) Pipe Works has secured a 1,600 ton contract for cast iron pipe to be shipped to Costa Rica. The order was taken in competition with Belgian and English shops, together with competition in this country.

—The Franklin Steel Castings Co., Franklin, Pa., manufacturers of steel castings of all descriptions, are building an addition to their machine shop, core room and No. 1 foundry, which will measure 180x100 ft. They are also adding an additional open hearth furnace, sand mill and two electric cranes, 35 and 15 tons each, together with additional lathes, shapers and saws, to take care of their increased business. The concern advise us that they are running to the full limit of their capacity, double shift, and have on their books orders for some 32,000 sets of M. C. B. couplers, which compels them to erect at once a separate building 200x100 ft. for this purpose alone.

—The Bethlehem Iron Co. of South Bethlehem, Pa., is now ready to roll plates from high grade open hearth steel on its new plate mill, the rolls of which are 126 inches in length. The product in this line will consist of plates for all purposes, which includes ship plate, boiler plate, tank, stacks, etc.

—The Bay View plant of the Illinois Steel Co. was shut

down June 30 for an indefinite period, the new scale of the Amalgamated association not having been signed by the company. The closing of the Bay View mills threw 1,200 men out of work temporarily and suspended a pay roll amounting to \$3,000 a day. The work of repairing the plant will not be interrupted.

—The Detroit (Mich.) Steel & Spring Co. has been quite busy for a considerable time past and has found it necessary to put the works on double time in order to keep up with the orders.

Machinery and Tools.

—The Westinghouse Electric & Mfg. Co., of Pittsburgh, has received an order from the Carnegie Steel Co., Limited, of Pittsburgh, for a complete electrical equipment for the Duquesne Steel Works, Duquesne, Pa. The substitution of electric for hydraulic power for the operation of cranes at Homestead Steel Works has been attended with very satisfactory results. The new electrical equipment at Duquesne will furnish power for all light cranes, and it is expected that electricity will be employed also in driving the rolls. There will be 16 large dynamos at the start, and the installation will be made with a view to adding other dynamos.

—The Kentucky Military Institute, Louisville, Ky., is shortly to put in a complete equipment for its manual training school machine shop and woodworking shop.

—What is said to be the greatest work ever accomplished by any steam shovel in loading iron ore was done recently at the Mountain Iron mine of the Consolidated Iron Co., at Virginia, Mich. The 65-ton Vulcan steam shovel loaded 171 cars of 25 tons each in 10 hours, or the enormous amount of 4,275 tons. The daily average for the shovel is 160 cars in 10 hours. The best previous record was made in this mine by a 60-ton Marion shovel, which loaded 145 cars of only 18 tons each.

—The W. T. Adams Machine Co. of Corinth, Miss., has purchased the plant of the Milburn Gin & Machine Co. at Memphis. The latter plant is said to have cost \$400,000 when first built. The Adams Company will remove its Corinth plant to Memphis and consolidate the two plants.

—A receiver has been appointed for the Falls River & Machine Co., of Cuyahoga Falls, O. The company's liabilities are placed at \$375,000 and assets at \$615,000. The company was bonded for \$300,000 in 1893.

Miscellaneous.

—The contract for the grading, masonry and trestle work of the new Butler & Pittsburgh, from the Allegheny river to Butler, has been awarded to C. I. McDonald of Pittsburgh, at a price approximating \$700,000. Operations will begin within five days, and the contractor agrees to complete the work by January 7, 1897.

—The Galveston Wharf Co. will rebuild its burned wharves. It will fill up the water front instead of erecting on piles, as heretofore.

—The Hauss Iron Nail Co. of New Albany, will equip the Louisville division of the P. C. C. & St. L., between Louisville and Indianapolis, with the Hauss patented delivery and receiving iron nail crane, recently adopted by the United States postoffice department for exchanging mail bags to and from fast trains at stations where trains do not stop. This device will exchange mail bags at a speed of 70 miles per hour. The St. Paul & Duluth system will be equipped shortly, and several railroad companies of the country are negotiating for this equipment. Dr. Hauss, the inventor, who holds the controlling interest, is surgeon of the Pennsylvania Company, with headquarters at New Albany, Ind.

—The tunnel under the Hudson river at New York, which was partially built several years ago, has been closed up for over three years and no work has been done upon it. At a meeting of the bondholders in London it was voted to foreclose the mortgage and turn the property over to a new company, which will raise the money necessary to finish the tunnel.

—A new firm of railway brokers recently established at St. Louis, Mo., is a strong combination of experts and progressive business men. Its title is J. H. Taylor & Co. and its headquarters are in the Wainwright building. Mr. Taylor, of this firm, is a railroad man of large experience as a master mechanic, car builder and general superintendent. His thorough knowledge of this industry is therefore available to patrons. Such an authority can often give advice and suggestion in the selection of railway equipment and material that will save large sums to inexperienced buyers. The members of this firm are also consulting and mechanical engineers.

—The American Wood Preserving Company of Philadelphia, has just received through its southern representative, F. A. Kummer, C. E., 23 South street, Baltimore, Md., an order for 800 gals. of its timber preservative, to be used in treating the white oak ties and guard timbers of a bridge now being built by the Cincinnati, New Orleans & Texas Pacific over the Cumberland river. The increased use of this preservative by various leading railroads is the result of its peculiar value in penetrating and preserving hardwoods. At the same time its effect on softwoods, as has been stated in these columns, is to harden, as well as to penetrate and preserve them. An important western road has recently placed a large order for use on red oak timber.

—The Chicago & Northwestern Railway Company has let contract to Chicago Dredging and Dock Company for a car ferry and boat slip near the entrance of the harbor at Manitowoc, Wis., with about 2,200 lin. ft. of shore protection along the lake. The car ferry slip will take in boats 400 ft. in length, 55 ft. in width; boat slip 800 ft. in length and 60 ft. wide. Slip will be dredged 21 ft. below low water.